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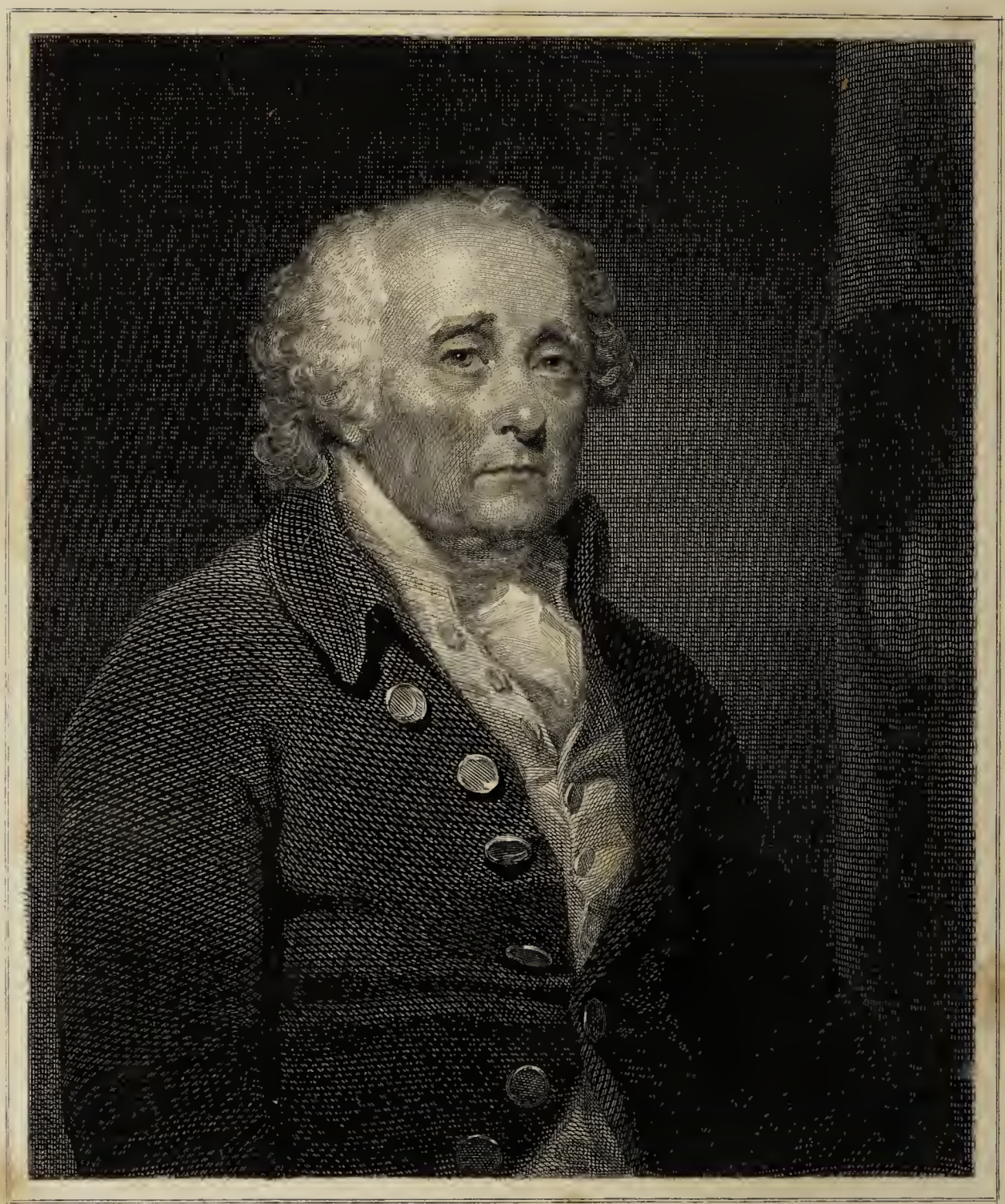

Sir Willm Dolbens, BARt LL.D.
Late a Vice President of the Society
for the Encouragement of Arts, Manufactures and Commerce.

Engraved by Charles Warren, from a picture by Mather Brown,
in the Hall of Christchurch, Oxford.

16766

TRANSACTIONS

OF THE

SOCIETY,

INSTITUTED AT LONDON,

FOR THE

ENCOURAGEMENT

OF

ARTS, MANUFACTURES,

AND COMMERCE;

WITH THE

Premiums offered in the Year 1814.

VOL. XXXII.

LONDON:

PRINTED BY R. WILKS, CHANCERY-LANE;

Sold by the HOUSEKEEPER, at the SOCIETY'S HOUSE, in the ADELPHI; and by Messrs. J. WHITE, BECKET, JOHNSON, CADELL and DAVIES, PHILLIPS, WALTER, RICHARDSON, LONGMAN and REES, NORMANVILLE & FELL, TAYLOR, and T. WOODFALL, 14, Sloane Street, Chelsea.

[Price TEN SHILLINGS AND SIXPENCE.]

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CONTENTS.

	Page
Preface - - - -	iii
List of Officers - - -	3
Premiums offered in 1814 - -	4
General Conditions - -	20
Rewards bestowed - -	22
Papers in Agriculture - -	25
Papers in Polite Arts - -	67
Papers in Manufactures - -	85
Papers in Mechanics - -	91
Papers in Colonies and Trade. -	197
Presents received - -	211
Models and Machines of the present Year	215
List of Members - - -	307
Index - - - -	257
Reference to the Engravings, and Directions to the Book-Binder -	275

PREFACE.

THE Society, in conformity to their usual custom of paying due respect and attention to the memory of those individuals who have contributed to extend the useful objects of their Institution, have this year prefixed to their Volume the Portrait of the late Sir WILLIAM DOLBEN, Bart. who, for a long series of years, was a zealous promoter of the Arts, Manufactures and Commerce of his Country.

Sir WILLIAM DOLBEN became a Member of the Society in February, 1759, was elected a Vice-President in March, 1784, and was very attentive in the discharge of that duty, till the infirmities of age, some years previous to his decease, rendered it too arduous an undertaking for his enfeebled constitution; this he stated in a very impressive letter to the Society, begging leave to decline the honor, as he found himself unable to execute the office in a manner suitable to his own conscientious views upon the subject.

The Society in answer, expressed their great concern for the cause of his offered resignation, but unanimously desired that he would continue to retain the situation, without being considered responsible for the duties of the office;—with this request he complied.

Sir WILLIAM DOLBEN was a Vice-President of the Marine Society, and took an active part in their concerns. He represented the University of Oxford in Parliament for nearly thirty years, and had also set in one Parliament for the County of Northampton. He died at Bury St. Edmunds, in April 1814, at the advanced age of eighty-seven.

The arrangement of the present Volume will be found in the usual order, commencing with the Class of Agriculture, under which several valuable Communications will be found.

The Plantations of WILLIAM LIDDELL, Esq. at Kildy Grange, are not only interesting from the quantity of young Oaks which they contain in a flourishing state, but as they bid fair, from their apparent value, to excite a spirit of emulation for similar improvements in that neighbourhood.

Much

Much praise is due in respect to the exertions of GODFREY HIGGINS, Esq. for making good meadow and pasture Land from 180 Acres of waste, which, from local situation, lay under a great number of disadvantages, requiring much skill and judgment to overcome.

The growth of Larch becomes daily of greater importance than formerly, not only from its value as timber, but from the general application of its bark for tanning leather, which will be the means of preserving much oak timber that would otherwise have been destroyed, owing to the high price of bark. Mr. E. BACKHOUSE's Plantations of Larch are very extensive, and diversified with other forest trees.

Mr. T. H. SCOTT's Improvements of Waste Land are important, not only from their great extent, but from the valuable hints they furnish to persons inclined to similar pursuits, and the certain advantages arising from money so expended.

The Turn-wrest Plough invented by Mr. J. WILKINSON, is sanctioned by a number of most respectable Signatures; it is singularly useful in ploughing the sides of hills, and in laying land level, and is likely to be found an implement of great utility in Agriculture.

From the construction of Mr. J. Braby's Cart and Drag, much security and ease are afforded to horses descending steep hills with heavy loads, besides the advantage arising from its mode of discharging partially at will its contents, in the manuring of land.

The attention of the public has been lately much excited by the controversy respecting the culture and application of Mangel Wurzel. Mr. Leonard Phillipps, Jun. has furnished much useful information respecting this plant, and its preservation during the winter months, when other food for cattle is scarce. It may fairly be inferred, from the general observations made here and in many public journals, that it is a very valuable plant for fattening cattle, that its product is greater on an equal extent of land than any other vegetable crop known; that the flesh of cattle fed therewith is remarkably well-flavored; and that the milk and butter furnished by cows using it as general food, is very rich and well-flavored, although their milk may not be so abundant in quantity as is produced from being fed on some other vegetables.

The information afforded by J. C. Curwen, Esq. on his method of soiling or feeding cattle in the house, displays a new system of providing animal food in perfection

in

in a shorter period than has heretofore been supposed possible; and his testimony is strong in favor of the great value of the Mangel Wurzel in fattening cattle.

The simple and ingenious mode of raising new potatoes during the winter months, as exemplified by Miss Ann Clague, will probably afford a pleasing and useful amusement to persons inclined to Agricultural Experiments, besides furnishing, at little expense, a valuable article for the table, as the potatoes thus grown have certainly a superior flavor to any before raised upon the numerous plans heretofore proposed for that purpose. This improved mode of rearing a valuable vegetation is particularly interesting to an attentive observer of the works of nature.

Numerous Rewards have been given this Session in the Class of Polite Arts, the particulars of which are given in page 22, at the end of the List of the Premiums offered. The following articles occur in the present Volume under that Class.

An instrument called a Centro-linead, useful for drawing in Perspective, invented by Mr. Peter Nicholson, which is easy in application, and performs with greater

facility than the instruments generally used for such purposes.

An instrument useful in Perspective Drawings, invented by Mr. J. Farey, Jun. and which he observes he has found a very valuable acquisition in his practice.

An instrument invented by Mr. Edmund Turrell, for drawing in Perspective, and called by him a Perspectograph; it is simple in form, small in bulk, and moderate in price, and performs the business with so much accuracy, that chrystallizations, or the most difficult objects, may be perfectly delineated.

Under the Class of Manufactures, the Calico Printer's Block invented by Mr. Marshall, deserves attention for the ingenuity of its construction, and the variety of patterns and colours which it is capable of exhibiting in use.

The various inventions and improvements produced this Session under the Class of Mechanics, will be found highly interesting and advantageous.

Any matter conducive to improvement and saving of expense in building of Ships, must be important to a nation depending so much as this upon its Navy.

The

The difficulty of procuring timber formed by nature with the particular curves wanted in Ship-building, is well known, and the merit of the improved method of bending Timber upon Mr. WILLIAM HOOKEY'S plan, will be duly appreciated.

The Pump invented by Mr. PETER HEDDERWICK, by means of which double the usual quantity of water can be raised in the same time from the same bore, will probably be the means of saving many a Ship, as the Pistons in common use cannot discharge a sufficient quantity of water in case of a bad leak in the vessel.

Mr. CHARLES WILLIAMS' Family Mill will enable those who grow their own corn, to be certain of producing good flour without risk of change or embezzlement by the miller.

The Wind-up Bedstead, invented by Mr. WOODALL, will afford great comfort to sick or lame Persons, as a single person can change the position of the Patient without exposing him to the unpleasant jerks which have usually atttended those heretofore in use.

The Crutches presented by Mr. LAURENCE, have much merit, from the simplicity of their construction, and the

the ease afforded both to the hands and shoulders of the invalid, who requires such assistance.

The cheap and useful Octant invented by Mr. Byron, will be a very valuable instrument to the sailor, and save him much trouble in calculating the ship's way.

The lovers of harmony will be highly gratified by Mr. Levien's improvement of the Harp Guitar, an instrument which displays the female form to advantage, and from the addition made by him, is capable of being much more useful in its extent of power, and of uniting its effects in concert with other instruments.

Great merit attaches to Mr. Peter Nicholson, for his indefatigable exertions in the advancement of useful knowledge, and confirming on mathematical principles the objects he brings forward to the public. His new and correct mode of squaring a Hand-rail round the Winders of a Stair-case, not only saves a great expense in that article, but its principle is also useful in all works where both plan and elevation are circular; and in works of double curvature it will effect a great saving of time and trouble to the workmen.

The Equation Work for a Clock, invented by Mr. H. Ward, to ascertain the difference between the sun's apparent

parent and mean motion, will be found deserving of attention.

The dispatch of business in the service of the Navy, and the means of preventing the embezzlement of Government stores, are most important objects, both of which are attained in the rigging department by Mr. HORN's invention for cutting Canvas for the use of riggers.

Mr. MARTIN's Weighing Machine possesses simplicity and portability, and will be a useful instrument in a family to ascertain the correctness of weight of the articles purchased.

The aukwardness and waste arising from feeding horses with corn in nose-bags whilst standing in the street, must be obvious to every observer, and it will afford pleasure to a humane mind to alleviate any of the inconveniencies to which these noble animals are subject, and which will be effected in a great degree by Mr. CHARLES DRURY's invention.

Perhaps at no period of time whatever has more pains been taken to promote the education of youth than at present; the means which have been adopted both by Mr. FOLSCH and Mr. KEYWORTH, to accomplish this end, have

have great merit, and each of their modes will be found in practice conducive to that purpose.

Where persons have occasion to pass through a doorway, frequently great delay is occasioned where the door opens only one way, and is required to be closed by the person who opens it. The Double Spring invented by Mr. STONE, allows the door to open with ease either way, and to close itself when quitted.

Seldom a year elapses without dreadful accidents occurring to persons from cleaning windows, or painting the sash-frames on the outside of the building. By Mr. WILSON's invention, either sheet of the sash may be easily brought within the room by a common servant, to be perfectly cleaned, and replaced without injury to the sash-cords or beadings of the window, and all danger prevented.

Great ingenuity has been displayed by Mr. BOYCE, in the construction of a Safety Boat or Raft, to preserve the lives of persons who fall overboard from a ship, and in furnishing the means of persons reaching the shore, where a common boat could not live.

To Mr. CLEGHORN the public are much indebted for the great pains he has taken in various modes of affording

assistance

assistance to seamen in danger. The Buoyant Line lately invented by him, to preserve the lives of mariners, will be found to possess great merit, both from the simplicity of its construction, and its certainty of effect.

Mr. Scott's method of uniting quickly the standing Rigging of Ships when broken in action, will probably prevent many of the accidents to which our ships of war are liable, from the usual efforts of the enemy to direct their fire against the Rigging, in order to secure their own escape, and prevent our sailors from manœuvring the vessel.

J. Miller, Esq. of Bedford, is intitled to great commendation for his various philanthropic exertions to preserve persons from a watery grave; several of his inventions have been noted in our former Volumes, and it is a pleasure now to add that of preserving persons from drowning when the ice breaks under them, by a cheap, simple, speedy and efficacious method.

Under the Class of Colonies and Trade, the encouragement of our fisheries has long been attentively kept in view by the Society, and the Communication by Mr. Sievers on the method of taking and curing Herrings in the Dutch method, will considerably tend to promote the object.

The

The method of preserving Mackarel, as described by Mr. LONDON, will be found of great importance to the public, by introducing a valuable stock of excellent provision, which has hitherto been too much neglected.

We cannot proceed to make our observations on Dr. ROXBURGH's important Communication on the different products of the East Indies, without pausing to contemplate the extraordinary exertions, which, for a long series of years he has made for the improvement of Natural History, particularly that of the East Indies. Distinguished by a mind clear and comprehensive, he has displayed infinite knowledge in all his descriptions and arrangements, and a most unremitting industry in all his pursuits. We lament to announce, that in the present month he has paid the great debt of nature, and it remains to us to pay a last tribute of respect to this inestimable character.

The Committee, in arranging the Subjects of the present Volume, have endeavoured to be concise in the Communications, rather than to adopt the redundancy of words frequently adopted by the Claimants; the Volume, therefore, though not apparently large in size, contains much valuable information.

The

The ENGRAVINGS will be found more numerous than usual, in order that the subjects mentioned may be fully elucidated. The Drawings of the Machines have been made by Mr. C. VARLEY and Mr. NICHOLSON; that of the Portrait by Mr. C. UWINS. The Engraving of the Portrait was executed by Mr. C. WARREN; and the other Engravings by Mr. AMBROSE WARREN, Mr. DAVIES, Mr. TURRELL, Mr. J. TAYLOR, and Mr. BACON, and the whole executed in a manner highly creditable to the Society, and to the Artists.

The Improvements in the Society's Model Room have given general satisfaction, and the Library of the Society continues annually to increase.

The Society take the present opportunity of returning their Thanks to the different Public Bodies and Individuals who have honored them with Presents during the Session, the particulars of which are noticed in page 211 of the present Volume.

It is with great pleasure that we continue to announce the flourishing state of the Society; that in the present Session they are proceeding to reward many objects of great consequence, and are ever ready to pay attention to such of the useful Arts as are likely to benefit the Public; and

and that their funds enable them to extend their Bounties to many objects not particularized in their List of Premiums.

The Society desire it to be clearly understood, that, as a Body, they are not responsible for any opinion or representation of facts contained in the following pages.

February, 1815.

PREMIUMS

OFFERED IN THE YEAR 1814.

BY THE SOCIETY

INSTITUTED FOR THE ENCOURAGEMENT

OF

ARTS, MANUFACTURES, AND COMMERCE,

IN THE ADELPHI, LONDON.

THE Meetings of the Society are held at their House in the Adelphi, London; and the consideration of the Claims, offered in the present List, will take place, during the Session of the Society, commencing on Wednesday, the 26th of October, 1814.

ADVERTISEMENT TO THE PUBLIC.

THE Chief objects of the SOCIETY are to promote the Arts, Manufactures, and Commerce of this Kingdom, by giving honorary or pecuniary Rewards, as seems to them best adapted to the case, for all such useful Inventions, Discoveries, and Improvements, (though not mentioned in this book) as tend to that purpose; and, in pursuance of this plan, the Society have already expended above EIGHTY THOUSAND POUNDS, advanced by voluntary subscriptions of their members, and legacies bequeathed.

The Register of the Premiums and Bounties they have given, which may be seen at the SOCIETY's house in the *Adelphi* will show the very great advantages which the Public have derived from this Institution.

The meetings of the SOCIETY are held every *Wednesday*, at seven o'clock in the evening, from the fourth *Wednesday* in *October* to the first *Wednesday* in *June*. The several Committees meet on other evenings in the week during the session, as particularly mentioned in their printed book of Rules and Orders.

In order still farther to promote the laudable Views of the SOCIETY, it may be necessary to explain the mode by which members are elected.

Each member has the privilege, at the meetings of the SOCIETY, or by letter to the Secretary, to propose any person who is desirous to become a member, provided the proposal contains the name, with the full addition, and place of abode, of the proposed member, and is signed by three members of the SOCIETY.

Peers of the Realm or Lords of Parliament are, on their being proposed, immediately balloted for; the names of other persons proposed to become Members are to be delivered to the Secretary, read at the next meeting of the SOCIETY, and then inserted in lists which are hung up in the Society's room: they are balloted for at the second following ordinary meeting. In both cases, if two-thirds of the members then voting ballot in their favour, they are deemed perpetual members upon payment of not less than Twenty Guineas in one sum, or subscribing members upon payment of any sum not less than Two Guineas annually.

All members are entitled to vote and assist in all the business of the SOCIETY and the several Committees. The members have also the privilege of recommending two persons as auditors at the meetings of the SOCIETY; and, by addressing a note to the housekeeper, of introducing their friends to examine the various Models, Machines, and Productions, in different branches of Arts, Manufactures, and Commerce, for which rewards have been bestowed; also to inspect the magnificent series of moral and historical Paintings, executed by the late J. BARRY, Esq. which, with some valuable Busts, Statues, &c. decorate the Great Room.

Members have the use of the Society's Library, which is valuable and annually increasing, from donations of scientific and useful books and engravings. The SOCIETY are highly sensible of the great importance of such acquisitions, and are happy to record them, with the names of the donors, in the Volume annually published of the SOCIETY's Transactions, to which the members are entitled.

Ladies are eligible, as members of the SOCIETY, to all the Privileges thereof, and are alone entitled to vote by proxy at elections, through the medium of any gentleman who is a member, on his producing a written authority for the same.

The time appointed for admission to the Paintings or Models, is from ten to two o'clock, Sundays and Wednesdays excepted.

ORDERED, SOCIETY'S HOUSE, ADELPHI, JUNE 1st, 1814.

That the several candidates and claimants, to whom the society shall adjudge Premiums or Bounties, do attend at the Society's House in the Adelphi, on the last Tuesday in May, 1815, at eleven o'clock in the Morning precisely, to receive the same; that Day being appointed by the Society for the Distribution of their Rewards: And before that time no Premium or Bounty will be delivered, except to those who are about to leave the Kingdom.

In cases where the Society may think fit to admit excuses for not attending in person, deputies may be substituted to receive the Rewards, provided such Deputies are either Members of the Society, or superior Officers thereof.

A LIST of the Officers of the SOCIETY, *and Chairmen of the several Committees.*

PRESIDENT.

Charles, Duke of Norfolk, F. R. and A. S.

VICE PRESIDENTS.

John, Duke of Bedford, F. A. S.
Hugh, Duke of Northumberland, F. R. and A. S.
G. G. L. Marquis of Stafford, K. G.
Jacob, Earl of Radnor, F. R. and A. S.
Robert, Earl of Liverpool, F. R. S.
Charles, Earl of Romney, F. R. S.
Earl Percy
Hon. Robert Clifford, F. R. and A. S.
Sir Robert Peel, Bart. M. P.
Sir Watkin Lewes, Knt.
Sir Nathaniel Conant, Knt.
Thomas Pitt, Esq. F. A. S.
Richard Clark, Esq. Chamberlain, F. A. S
Richard Powell, M. D.
John Christian Curwen, Esq.
Richard Wilson, Esq. F. A. S.

CHAIRMEN OF COMMITTEES.

Accounts.

William Lumley, Esq.
Abraham Osorio, Esq.

Correspondence and Papers.

William Tooke, Esq.
W. Thomas Brande, Esq. F.R.S.

Polite Arts.

J. Barber Beaumont, Esq. F.A.S.
R. H. Solly, Esq. F. R, and A. S.

Agriculture.

T. H. Andrew, Esq.
Charles Waistell, Esq.

Manufactures.

J. Pearsall, Esq.
W. Beckett, Esq.

Mechanics.

J. Kenworthey Cooke, Esq.
Thomas Gill, Esq.

Chemistry.

Henry Coxwell, Esq.
G. D. Midgley, Esq.

Colonies and Trade.

William Lewis, Esq. F. L. S.
William Vaughan, Esq.

Miscellaneous Matters.

William Kirkby, Esq.
Daniel Beaumont, Esq.

SECRETARY, Charles Taylor, M. D.
ASSISTANT SECRETARY, Mr. Thomas Woodfall.
HOUSEKEEPER, Miss A. B, Cockings.
COLLECTOR, Mr. Robert Elwin.

PREMIUMS offered in 1814, *by the* SOCIETY *instituted at* London, *A. D.* 1754, *for the Encouragement of Arts, Manufactures, and Commerce,*

PREMIUMS IN AGRICULTURE.

THE candidates for planting all kinds of trees are to mention the nature of the soil, to produce certificates that the respective plantations are properly fenced and secured, and particularly to state the condition of the plants at the time of signing such certificates. Any information which the candidates for the following premiums may choose to communicate, relative to the methods made use of in forming the plantations, or promoting the growth of the several trees, or any other observations that may have occurred on the subject, will be thankfully received.

It is the intention of the Society that such lands only as are not calculated for the purposes of husbandry, should be employed for the purposes specified in these advertisements relative to plantations.

Article 1. ACORNS.

FOR having set between the first of October, 1812, and the first of April, 1813, the greatest quantity of land, not less than ten acres, with acorns, with or without seeds, cuttings, or plants of other trees, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

2. For the second greatest quantity of land, not less than five acres, set agreeably to the above conditions; the silver medal.

Certificates of setting agreeably to the above conditions, and that there are not fewer than three hundred young oaks on each acre, to be delivered to the Society on or before the last Tuesday in December, 1814.

3. RAISING OAKS. To the person who shall have raised, since the year 1810, the greatest number of oaks, not fewer than five thousand, either from young plants or acorns in order to secure a succession of oak timber in this kingdom; the gold medal.

4. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates that there were on the land, at least the number of young oak trees required, in a thriving condition, two years after the planting, with an account of the methods pursued in making and managing the plantation, to be produced to the Society on or before the first Tuesday in January, 1815.

5. ASCERTAINING THE BEST METHOD OF RAISING OAKS. To the person who shall ascertain in the best manner by actual experiments, the comparative merits of the different modes of raising oaks for timber, either from acorns set on land properly dug or tilled, from acorns set by the spade or dibble, without digging, or tillage, either on a smooth surface, or among bushes, fern, or other cover; or from young plants previously raised in nurseries, and transplanted; regard being had to the expence, growth, and other respective advantages of the several methods; the gold medal.

The *accounts* and proper *certificates*, that not less than one acre has been cultivated in each mode, to be produced to the Society on or before the last Tuesday in Nov. 1814.

6. CHESNUTS. For having sown or set, between the first of October, 1812, and the first of April, 1813, the greatest quantity of land, not less than six acres, with Spanish chesnuts, with or without seeds, cuttings, or plants of other trees, adapted to such soil, at the option of the candidate; and for effectually fencing and preserving the same, in order to raise timber; the gold medal.

7. For the second greatest quantity, not less than four acres; the silver medal.

Certificates of sowing or setting, agreeably to the above conditions, and that there are not fewer than three hundred chesnut plants in a thriving state, on each acre, to be delivered to the Society on or before the first Tuesday in January, 1815.

8. ELM. For having planted the greatest number of the English elm, not less than eight thousand, between the twenty-fourth of June, 1812, and the twenty-fourth of June, 1813, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

9. For the second greatest number, not less than five thousand; the silver medal.

Certificates of having planted agreeably to the above conditions, that the plants were in a healthy and thriving state, two years at least after making the plantation, and specifying the distance of the plants, to be delivered to the Society on or before the first Tuesday in April, 1815.

10. LARCH. For having planted out, between the twenty-fourth of June, 1811, and the twenty-fourth of June, 1812, the greatest number of larch trees, not fewer than five thousand, and for having effectually fenced and preserved the same, in order to raise timber; the gold medal.

11. For the next greatest number, not fewer than three thousand; the silver medal.

Certificates of the number of plants, that they were in a healthy and thriving state two years at least after they were planted out, with a general account of the methods used in making the plantation, to be delivered to the Society on or before the last Tuesday in December, 1814.

N. B. The larch trees may be planted either mixed with other trees, or by themselves, as may best suit the convenience of the planter.

12. ASH. For having sown or set, in the year 1811, the greatest quantity of land, not less than six acres, with ash for timber, with or without seed, cuttings, or plants, of such other trees as are adapted to the soil; the gold medal.

13. For the next greatest quantity, not less than four acres; the silver medal.

Certificates of the sowing or setting, agreeably to the above conditions, that there are not fewer than six hundred ash plants on each acre, in a thriving and healthy condition, two years at least after the sowing or setting, with a general account of the methods used in making the plantation; to be delivered to the Society on or before the last Tuesday in December, 1814.

14. Forest Trees. To the person who shall have enclosed and planted, or set, the greatest number of acres (not less than ten) of land, that is incapable of being ploughed, such as the borders of rivers, the sides of precipices, and any land that has too many rocks, or that is not calculated to repay the expense of tillage, owing to the surface being too hilly, mountainous, or otherwise unfit for tillage, with the best sorts of forest trees, namely, oak, Spanish-chesnuts, ash, elm, beech, alder, willow, larch, spruce, and silver fir, with or without screens of Scotch-fir, adapted to the soil, and intended for timber trees, between the first of October, 1811, and the first of April, 1812; the gold medal.

15. For the second greatest quantity of land, not less than seven acres; the silver medal.

A particular *account* of the methods used in making and managing the plantations, the nature of the soil, the probable number of each sort of plants, together with proper *certificates* that they were in a healthy and thriving state two years at least after making the plantation, to be delivered to the Society, on or before the second Tuesday in January, 1815.

N. B. With the above forest trees, the seeds, cuttings, or plants, of such other trees as are adapted to the soil, and proper for underwood, may or may not be intermixed.

16. Norway Fir Seedlings. To the person who shall have planted in the united kingdom, during the year 1814, the greatest number, not less than two thousand, of red wood and white wood, Norway fir seedlings, at sufficient distances from each other to stand for timber trees; the gold medal.

Certificates of the number of plants, that they were in a thriving state two years at least, after they were planted out, with a general account of the method used in making the plantation, to be delivered to the Society, on or before the first Tuesday in December, 1816.

N. B. It is recommended to plant the seedlings of about three or four years growth and in a moderately good soil, somewhat sheltered; the wood from the district of Christiana is esteemed the best for carpenters and joiners use; and for spars and upers the trees near to Long Sound are most valued.

17. Walnut Trees. For having planted the greatest number of walnut trees, not less than five hundred, between the 24th of June, 1812, and the 24th of June, 1813, and for having effectually fenced and preserved the same, in order to raise timber, the gold medal.

18. For the next greatest number, not fewer than three hundred; the silver medal.

Certificates of having planted agreeably to the above conditions, and that the plants were in a healthy and thriving state, two years at least after making the plantations, and specifying the distance of the plants from each other, to be delivered to the Society, on or before the first Tuesday in April, 1815.

19. Securing Plantations of Timber Trees and Hedge Rows. To the person who shall give to the Society the most satisfactory account, founded on experience, of the most effectual and least expensive method of securing young plantations of timber trees, and hedge rows, from hares and rabbits, as well as sheep and large cattle, which at the same time shall be least subject to the depredations of wood-stealers; the silver medal.

The *accounts* and *certificates* of the efficacy of the method, to be produced to the Society on or before the last Tuesday in December, 1814.

20. Comparative Culture of Wheat, broad-cast, drilled and dibbled. For the best set of experiments, made on not less than twelve acres, four of which to be sown broad-cast, four drilled, and four dibbled, the two latter in equidistant rows, in order fully to ascertain which is the most advantageous mode of cultivating wheat; the gold medal.

It is required that every operation and expense of each mode of culture be fully described; and that proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce of the corn, the weight per bushel, and also of the straw, be produced to the Society on or before the first Tuesday in February, 1815.

21. Beans and Wheat. To the person who shall have dibbled or drilled between the first of December, 1813, and the first of April, 1814, the greatest quantity of land, not less than ten acres, with beans, in equidistant rows, and hoed the intervals twice or oftener, and shall have sown the same land with wheat in the autumn of the year 1814; the gold medal.

It is required that on account of the sort and quantity of beans, the time of dibbling or drilling, and of reaping or mowing them, the produce per acre thrashed, the expense of dibbling or drilling, hand or horse hoeing, the distance of the rows, and the quality of the soil, together with *certificates* of the number of acres, and that the land was afterwards actually sown with wheat, be produced on or before the second Tuesday in March, 1815.

22. Beans. To the person who, in the year 1814, shall discover and cultivate, either by the drill or dibbling method, on not less than five acres, a species of horse-beans or tick-beans, that will ripen their seeds before the 21st of August; the silver medal.

It is required that a particular account of the bean, the cultivation, and the expence attending it, with proper *certificates* of the nature and condition of the land on which the experiments were made, together with an *account* of the produce, the weight per Winchester bushel, and a sample of not less than a peck, be produced to the Society on or before the last Tuesday in December, 1814. It is apprehended that if a bean should be brought into cultivation with the habits of the hotspur, or other early peas, that it would in a great measure escape the danger arising from the collier-insect, or other insects, and allow more time for the farmers to till the land for the subsequent crop of wheat. The *accounts* and *certificates* to be delivered on or before the last Tuesday in December, 1814.

23. Parsnips. To the person who in the year 1814, shall cultivate the greatest quantity of land, not less than five acres, with parsnips, for the particular purpose of feeding cattle or sheep; the gold medal.

Certificates of the quantity of land so cultivated, with a particular *account* of the nature of the soil and weight of the produce on sixteen perches, and also of the condition of the cattle or sheep fed with the parsnips, and the advantages resulting from the practice, to be produced to the Society on or before the second Tuesday in February, 1815.

24. Buck Wheat. To the person who shall cultivate the greatest quantity of land with buck wheat, not less than thirty acres; the gold medal.

It is required that the time of sowing and reaping be noticed; also a particular *account* of the species, cultivation, and expense attending it, the manner of reaping it, thrashing it, and housing the grain; with proper *certificates* of the nature and condition of the land on which the experiments were made, and the name of the crop, if any, which the same land bore the preceding year, together with an *account* of the produce, and a sample of the seed, not less than a quart, be produced to the Society on or before the second Tuesday in January, 1815.

25. For the next greatest quantity, not less than fifteen acres, on similar conditions; the silver medal.

Information respecting its application to the feeding of cattle, hogs, and poultry, and other of its uses, is also desired. It is known to be particularly serviceable in furnishing honey to bees.

26. Bees, Wax, and Honey. To the person who shall erect, previous to the first day of September, 1814, an apiary containing the greatest number of hives or boxes stocked with bees, not less than sixty; the silver medal, or twenty guineas.

27. For the next greatest number, not fewer than forty stocks; ten guineas.

Proper *certificates* of the number of stocks, and that they have been in the possession of the claimant during the preceding summer, to be produced to the Society on or before the first Tuesday in March, 1815.

It is expected that the claimant will give such particular information on the subject, as may tend to benefit the public, and enable other persons to keep bees to advantage.

28. Raising Grass Seeds. To the person who shall raise the greatest quantity of each of any of the following named grass seeds, *viz.*—Meadow fox-tail (alopecurus pratensis), sweet-scented vernal grass (anthoxanthum odoratum,) Timothy grass (phleum pratense,) meadow fescue grass (festuca pratensis,) smooth-stalked meadow grass (poa pratensis,) rough-stalked meadow grass (poa trivialis;) the silver medal.

It is required that *certificates* from persons who have viewed them in a proper state, to identify that they are one or other of the seeds above-mentioned, indicating clearly the particular species, and noticing the quantity produced of such seeds, free from weeds or mixture of other grasses, together with proper samples of the seeds, be produced to the Society on or before the first day of February, 1815.

29. Preserving Turnips. To the person who shall discover to the Society the best and cheapest method of preserving turnips perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

It is required that a full and accurate *account* of the method employed, and the expense attending the process, together with *certificates* that the produce of four acres at the least have been preserved according to the method described, and applied to the feeding of sheep and neat cattle; that the whole were drawn out of the ground before the first day of February, in order to clear the greater part of it previous to its being prepared for corn, and to save the soil from being exhausted by the turnips; and also of the weight of an average sixteen perches of the crop; be produced to the Society on or before the last Tuesday in December, 1814.

30. For the next in quantity and merit, on not less than two acres; the silver medal.

31. Preserving Cabbages. To the person who shall discover to the Society the best and cheapest method of preserving drum-headed cabbages perfectly sound, and in every respect fit for the purpose of supporting and fattening sheep and neat cattle during the months of February, March, and April; the gold medal.

32. For the next in quantity and merit, on not less than two acres; the silver medal,

Conditions the same as for preserving turnips, Art. 29.—And the *accounts* to be produced on or before the last Tuesday in December, 1814.

33. Preserving Carrots, Parsnips, or Beets. To the person who shall dis-

cover to the Society the best and cheapest method of preserving carrots, parsnips, or beets, perfectly sound, and in every respect fit for the purpose of supporting horses, and fattening sheep and neat cattle, during the months of February, March, and April; the gold medal.

Conditions the same as for preserving turnips, Art. 29.—And the *accounts* to be delivered in, on or before the last Tuesday in December, 1814.

34. For the next in quantity and merit, on not less than two acres; the silver medal.

35. Potatoes. To the person who shall, in the year 1814, cultivate the greatest quantity of land which has not been used for the cultivation of potatoes for the space of twelve years past, not less than fifty acres, with potatoes of such qualities as to be fit for the use of the table in the months of April, May, and June, after their growth the preceding year; the gold medal, or thirty guineas.

36. For the next greatest number, not less than twenty acres; the silver medal, or fifteen guineas.

Proper *certificates* along with other necessary particulars, to be delivered in to the Society, on or before the first Tuesday in April, 1815.

37. These premiums are extended one year further, on similar conditions.

38. Preserving Potatoes. To the person who shall discover to the Society the best and cheapest method of preserving potatoes, two or more years, perfectly sound, without vegetating, and in every other respect fit for the purpose of sets and the use of the table, and consequently of supporting and fattening cattle; the gold medal, or thirty guineas.

It is required that a full and accurate *account* of the method employed, and the expense attending the process, with *certificates* that one hundred bushels at the least have been preserved according to the method described, and that one or more bushels of the same potatoes have been set, and produced a crop without any apparent diminution of their vegetative power, and also that they have been used at table, with entire satisfaction to the person who eat of them, together with a sample of one bushel, be sent to the Society on or before the last Tuesday in December, 1814.

39. For the next greatest quantity, not less than fifty bushels; the silver medal.

40. Making Meadow-Hay in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of making meadow-hay in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than fifty-six pounds of the hay; and *certificates* that at least the produce of six acres of land has been made according to the method described, and that the whole is of equal quality with the sample; to be produced on or before the first Tuesday in January, 1815.

41. Harvesting Corn in wet Weather. To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather; the gold medal.

A full *account* of the method employed, and of the expense attending the process, with not less than two sheaves of the corn, and *certificates* that at least the produce of ten acres has been harvested according to the method described, and that the whole is of equal quality with the samples, to be produced on or before the first Tuesday in January, 1815.

42. Gaining Land from the Sea. To the person who shall produce to the Society an account, verified by actual experiment, of his having gained the greatest quantity of land from the sea, not less than fifty acres, on the coast of Great Britain and Ireland; the gold medal.

Certificates of the quantity of land, and that the experiments were begun after the first of January, 1809, to be produced to the Society on or before the last Tuesday in December, 1814.

43. The same premium is extended one year further.

Certificates to be produced on or before the last Tuesday in December, 1815.

44. Improving Land lying Waste. For the most satisfactory *account* of the best method of improving any one of the following soils, being land lying waste or uncultivated, *viz.* clay, gravel, sand, chalk, peat earth, or bog, verified by experiments on not less than fifty acres of land; the gold medal.

45. For the next greatest quantity, not less than thirty acres; the silver medal.

It is required, that the land, before such improvement, be absolutely uncultivated, and in a great measure useless, and that, in its improved state, it be enclosed, cultivated, and divided into closes.

Certificates of the number of acres, of the quality of the land so improved, with a full *account* of every operation and expense attending such improvement, the state it is in as to the proportion of grass to arable, and the average value thereof, to be produced on or before the first Tuesday in February, 1815.

46. Manures. For the most satisfactory set of experiments, to ascertain the comparative advantages of the following manures, used as top-dressings on grass and corn land, *viz.* soot, coal-ashes, wood-ashes, lime, gypsum, night-soil, or any other fit article; the gold medal.

It is required that the above experiments be made between two or more of the above-mentioned manures, and that no less than two

acres of land be dressed with each manure.

An *account* of the nature of the soil, quantity, and expense of the manure and crops, with *certificates*, to be produced on or before the last Tuesday in February, 1815.

47. Raising Water for the irrigation of Land. To the person who shall discover to the Society the cheapest and most effectual method of raising water in quantities sufficient to be beneficially employed for the purpose of irrigating land, superior to, and cheaper than any other method now in use; the gold medal, or fifty guineas.

A model, on a scale of one inch to a foot, with *certificates* that a machine at large, on the same construction, has been used, specifying the quantity of water delivered in gallons per hour, and the height to which it was raised, to be produced to the Society on or before the first of March, 1815.

48. Paring Plough. To the person who shall invent and produce to the Society a machine or plough for the purpose of paring land preparatory to burning, superior to any hitherto known, or in use for such purpose, and to be worked by not more than one man and two horses; the silver medal, or twenty guineas.

The machine, and *certificates* that at least three acres have been pared by it in a proper manner, to be produced to the Society on or before the first of January, 1815.

49. Machine for Dibbling Wheat. To the person who shall invent a machine, superior to any hitherto known or in use, to answer the purpose of dibbling wheat, by which the holes for receiving the grain may be made at equal distances and proper depths; the silver medal and ten guineas.

The *machine*, with *certificates* that at least three acres have been dibbled by it, to be produced to the Society on or before the second Tuesday in January, 1815.

50. Machine for Reaping or Mowing Corn. For inventing a machine to answer the purpose of mowing or reaping wheat, rye, barley, oats, or beans, by which it may be done more expeditiously and cheaper than by any method now practised, provided it does not shed the corn or pulse more than the methods in common practice, and that it lays the straw in such a manner that it may be easily gathered up for binding; the gold medal.

The *machine*, with *certificates* that at least three acres have been cut by it, to be produced to the Society on or before the second Tuesday in December, 1814. Simplicity and cheapness in the construction of this and the preceding machine, will be considered as principal parts of their merit.

51. Thrashing Machine. To the person who shall invent a machine by which corn of all sorts may be thrashed more expeditiously, effectually, and at a less expense, than by any method now in use; the gold medal.

The *machine*, or a model, with proper *certificates* that such a machine has been usefully applied, that at least thirty quarters have been thrashed by it, and of the time employed in the operation, to be produced to the Society on or before the last Tuesday in February, 1815.

52. Destroying the Grub of the Cockchafer. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying the grub of the cockchafer, or of preventing or checking the destructive effects which always attend corn, peas, beans, and turnips, when attacked by those insects; the gold medal.

The *accounts*, with proper *certificates*, to be produced on or before the first Tuesday in January, 1815.

53. Destroying Worms. To the person who shall discover to the Society an effectual method, verified by repeated and satisfactory trials, of destroying worms, or of preventing the destructive effects they occasion on corn, beans, peas, or other pulse; the silver medal.

The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1815.

54. Destroying the Fly on Hops. To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known or practised, on not less than four acres of hop ground; the gold medal.

Accounts and *certificates* to be delivered to the Society on or before the first Tuesday in February, 1815.

55. Preventing the Blight, or Ravages of Insects, on Fruit Trees and Culinary Plants. To the person who shall discover to the Society the most effectual method of preventing the blight or ravages of insects on fruit-trees and culinary plants, superior to any hitherto known or practised, and verified by actual and comparative experiments; the silver medal.

The *accounts*, with proper *certificates*, to be delivered to the Society on or before the second Tuesday in December, 1814.

56. Cure of the Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments; the gold medal.

It is expected that the candidates furnish accurate *accounts* of the symptoms and cure of the disease, together with the imputed cause thereof, and the actual or probable means of prevention, which, with proper *certificates*, must be delivered to the Society on or before the first Tuesday in February, 1815.

57. Cure of the Foot-Rot in Sheep. To the person who shall discover to the Society the best and most effectual method of

curing the foot-rot in sheep; the silver medal.

It is required that the cure be ascertained by repeated and satisfactory experiments, and the method of performing it be verified by proper *certificates* delivered to the Society on or before the first Tuesday in February, 1815.

58. Preventing the ill Effects of Flies on Sheep. To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies; the silver medal.

It is required that the method be ascertained by repeated experiments, and that a *certificate* of its efficacy be delivered to the Society on or before the first Tuesday in December, 1814.

59. Protecting Sheep. To the person who, in the year 1813, shall protect the greatest number of sheep, not fewer than one hundred, by hovels, sheds, or any other means, and give the most satisfactory account, verified by experiment, of the advantages arising from the practice of protecting sheep from the inclemency of the weather, by hovels, sheds, or any other means; the gold medal.

A particular *account* of the experiments made, with the advantages arising therefrom, together with the expence, and *certificates* of its utility, to be produced to the Society on or before the first Tuesday in March, 1815.

N. B. It is required that the *certificates* shall specify the length of time the sheep were so protected, and the manner in which they were maintained during that time; together with the general method of managing them.

60. Culture of Hemp. The Society wishing to encourage the growth of hemp for the use of the navy in every part of the united Empire, offer to the person who shall sow with hemp, in drills at least eighteen inches asunder, the greatest quantity of land in any part of the united Empire, not less than fifty acres statute measure, in the year 1814, and shall at the proper season cause to be plucked the summer hemp, (or male hemp bearing no seed) and continue the winter hemp (or female hemp bearing seed) on the ground until the seed is ripe; the gold medal.

61. To the person who shall sow with hemp, in drills at least eighteen inches asunder, the next greatest quantity of land in any part of the united Empire, not less than twenty-five acres, statute measure, in the year 1814, and shall at the proper season cause the same to be plucked as abovementioned; the silver medal.

Certificates of the number of acres, of the distance of the drills, of the plucking of the hemp, with a general *account* of the soil, cultivation, and produce, to be delivered to the Society, along with fourteen pounds of the hemp and two quarts of the seed, on or before the second Tuesday in January, 1815.

62. Feeding of Cattle. For the best experiments on stall feeding of cattle (not less than five head) to be continued for the space of twelve months, in order to prove the earliest maturity and greatest propensity to fatten, of the most approved breeds of cattle in Great Britain, specifying the nature of the food given, together with the daily consumption of each beast, with its weekly increase in weight, and such other observations as may be deemed of consequence; the gold medal.

A full *account* of the methods employed, and of the expenses attending the same, and *certificates* of the sundry matters stated, to be produced on or before the second Tuesday in January, 1815.

PREMIUMS FOR DISCOVERIES AND IMPROVEMENTS IN CHEMISTRY, DYEING, AND MINERALOGY.

63. Preserving Seeds of Vegetables. For the best method of preserving the seeds of plants in a state fit for vegetation a longer time than has hitherto been practised, such method being superior to any known to the public, and verified by sufficient trial, to be communicated to the Society on or before the last Tuesday in December, 1814; the gold medal, or thirty guineas.

64. Preventing the Dry-Rot in Timber. To the person who shall discover to the Society the cause of the dry-rot in timber, and disclose a certain method of prevention superior to any hitherto known; the gold medal, or thirty guineas.

The *accounts* of the cause, and method of prevention, confirmed by repeated experiments, to be produced to the Society on or before the last Tuesday in Dec. 1814.

65. Preserving Salted Provisions from becoming rancid or rusty. To the person who shall discover to the Society the best, cheapest, and most efficacious method of preserving salted provisions from becoming rancid or rusty; the gold medal, or thirty guineas.

A full *description* of the method, with proper *certificates* that it has been found on repeated trials to answer the purpose intended, to be produced to the Society on or before the first Tuesday in February, 1815.

66. Refining Whale or Seal Oil. For disclosing to the Society an effectual method of purifying whale or seal oil from the glutinous matter that incrusts the wicks of lamps, and extinguishes the light though fully supplied with oil; the gold medal, or fifty guineas.

It is required that the whole of the process be fully and fairly disclosed, in order that satisfactory experiments may be made by the Society to determine the validity of

the claim; and *certificates* that not less than twentygallons have been purified according to the process delivered in, together with two gallons of the oil in its unpurified state, and two gallons so refined, to be produced to the Society on or before the second Tuesday in February, 1815.

67. Manufacturing Tallow Candles. To the person who shall discover to the Society a method of hardening or otherwise preparing tallow, so that candles may be made of it which will burn as clear and with as small a wick as wax candles, without running, and may be afforded at a less expense than any at present made with spermaceti; the gold medal, or fifty guineas.

Certificates that 112lb. of such tallow have been made into candles, and 12lb. of the candles made thereof, to be produced to the Society on or before the second Tuesday in January, 1815.

68. Candles from Resin, or other Substances. To the person who shall discover to the Society the best method of making candles of resin, or any other substance, fit for common use, at a price much inferior to those made of tallow only; the gold medal, or thirty guineas.

Six pounds at least of the candles so prepared, with an *account* of the process, to be delivered to the Society on or before the last Tuesday in December, 1814.

69. Method of separating Sugar in a solid Form from Treacle. To the person who shall discover to the Society the best method of separating sugar from treacle in a solid form, at such an expense as will render it advantageous to the public; the gold medal, or fifty guineas.

A quantity of the sugar so prepared in a solid form, not less than thirty pounds weight, with an *account* of the process, and *certificates* that not less than one hundred weight has been so prepared, to be produced to the Society on or before the first Tuesday in February, 1815.

70. Increasing Steam. To the person who shall invent and discover to the Society a method, verified by actual experiments, of encreasing the quantity or force of steam in steam engines, with less fuel than has hitherto been employed, provided that in general the whole amount of the expences in using steam engines may be considerably lessened; the gold medal, or thirty guineas.

To be communicated to the Society on or before the first Tuesday in January, 1815.

71. Substitute for Tar. To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of the United Kingdom and its Colonies; the gold medal, or one hundred guineas. A quantity of the substitute, not less than one hundred weight, with *certificates* that at least one ton has been manufactured and that it can be afforded at a price not exceeding that of the best foreign tar, together with an *account* of the process, to be delivered to the Society on or before the first Tuesday in March, 1815.

72. Turpentine from the Scotch Fir or Pinus Sylvestris. For the greatest quantity of turpentine, not less than two hundred weight, prepared in Great Britain, from that species of fir, called the Scotch fir, or Pinus sylvestris, Linn.; the gold medal.

Certificates of the turpentine being prepared from such trees of British growth, together with fifty-six pounds of the turpentine, to be delivered to the Society on or before the second Tuesday in January, 1815.

73. For the next greatest quantity prepared, not less than one hundred weight, on similar conditions; the silver medal.

N. B. The Society being in possession of the method practised for extracting turpentine from the trees whilst growing, and of samples so procured, information will be given upon that subject, on application for that purpose, at the Society's house.

74. Preparation of Tan. To the person who shall prepare, in the most concentrated form, so as to be easily portable, and at a price applicable to the purposes of manufacturers, the largest quantity, not less than one hundred weight of the principle called by the French *tannin*, which abounds in oak bark and many other vegetable substances; the gold medal, or thirty guineas.

Certificates of the superior quality of the quantity so prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1815.

75. Indelible Ink. To the person who shall discover to the Society a method of making a black ink proper for writing, superior to any at present known, indestructible by chemical applications, and not dearer than that which is now in common use; the silver medal, or fifteen guineas.

Certificates that not less than two gallons of such ink have been actually prepared, and found to possess the qualities above-mentioned, with a full detail of the process of making it, and two quarts of the ink to be delivered to the Society on or before the second Tuesday in January, 1815.

76. Preparation of a red Stain for Cotton Cloth. To the person who shall communicate to the Society the cheapest and most effectual method of printing or staining cotton cloths with a red colour, by an immediate application of the colouring matter to the cloth, equally beautiful and durable with the red colours now generally procured from decoctions of madder; the gold medal, or fifty guineas.

Certificates that the above process has been advantageously used on ten pieces of calico, each twenty-one yards or upwards in length; one piece of the calico so printed

a quart of the colour in a liquid state, and a full *account* of the preparation and application to be produced to the Society on or before the second Tuesday in January, 1815.

77. Preparation of a green Colour for printing Cotton Cloth. To the person who shall communicate to the Society the best and cheapest method of printing with a full green colour on cotton cloth, by an immediate application of the colouring matter from a wooden block to the cloth, equally beautiful and durable as the colours now formed from the complicated process of the decoction of weld on alumine, and the solutions of indigo by earths or alkaline salts; the gold medal, or fifty guineas.

Certificates and conditions as for Premium 76.

78. Rendering Muslin less Combustible. To the person who shall discover to the Society a method of rendering muslin less combustible, to be effected by a cheaper and more effectual mode than any hitherto known; the silver medal.

Specimens of the muslin so prepared, with a full account of the process employed for the purpose, to be produced to the Society on or before the first Tuesday in February, 1815.

N. B. It is expected that the means employed shall neither injure the quality of the muslin, stain it, nor damage any print or dye with which it may be coloured.

79. White Substance for the Basis of Paint. To the person who shall produce to the Society the best white substitute, superior to any hitherto known, for the basis of paint, equally proper for the purpose as the white-lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white-lead, the gold medal, or one hundred guineas.

A quantity of the substitute, not less than 50lb. weight, with an *account* of the process used in preparing it, and *certificates* that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in January, 1815.

80. Red Pigment. To the person who shall discover to the Society a full and satisfactory process for preparing a red pigment, fit for use in oil or water, equal in tone and brilliancy to the best carmines and lakes now known or in use, and perfectly durable; the gold medal, or fifty guineas.

One pound weight of such colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1815.

N. B. It is not required that the colour should resist the action of fire, or chemical applications, but remain unaltered by the common exposure to strong light, damps, and noxious vapours.

81. Ultramarine. To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, and durability, to the best prepared from lapis lazuli, and which may be afforded at a cheap rate; the gold medal, or thirty guineas.

The conditions are the same as in the preceding Premium for the red pigment.

82. Blue Pigment from Iron. To the person who shall invent, and discover to the Society the best blue pigment from iron, superior to Antwerp or Prussian blue in colour and durability, fit for use in oil or water, which may be afforded at a cheap rate; the gold medal, or thirty guineas.

One pound weight of the colour, and a full disclosure of its preparation, to be produced to the Society on or before the first Tuesday in February, 1815.

N. B. It appears from the analysis of lapis lazuli by Klaproth, and the experiments of Guyton, (related in the Annales de Chemie) that ultramarine is a blue sulphurat of iron, and that a blue substance much resembling it is constantly found amongst the scoriæ of blast furnaces where iron is reduced. The Society by offering the above premium wish to call the attention of persons to these facts, and encourage them to make experiments, in the hope of producing a blue pigment which may be substituted for ultramarine.

83. Destructive Effects from Moths. To the person who shall discover to the Society a cheap, easy, and effectual method, verified by repeated and satisfactory trials, of preventing the destructive effects occasioned by moths and other insects, in furs, woollens, and other articles, superior to any hitherto known or practised; the silver medal, or fifteen guineas.

The *accounts*, with proper *certificates*, to be produced to the Society on or before the first Tuesday in January, 1815.

84. Statuary Marble. To the person who shall discover, within Great Britain or Ireland, a quarry of white marble fit for the purposes of statuary, and equal in all respects to those kinds now imported from Italy; the gold medal, or one hundred guineas.

A block of at least three feet in length, two in height, and two in width, with an account of the situation of the quarry, and *certificates* of its possesssing considerable extent, to be produced to the Society on or before the first Tuesday in February, 1815.

N. B. In order to prevent useless expense or trouble to the claimant in forwarding so large a block, the Society will be ready to examine any smaller specimen of the marble, and express their opinion of its value to the candidate before the block required by the above premium is produced.

85. Preparation of Sulphuric Acid, from Sulphur, without the use of any Nitric Salt. To the person who shall prepare the largest quantity, (not less than one ton) of sulphuric acid from sulphur without any nitric salt, of a specific gravity not in-

ferior to the best sulphuric acid of commerce; the gold medal, or fifty guineas.

Certificates that not less than the above quantity of such an acid has been prepared, together with a sample, to be produced to the Society on or before the first Tuesday in January, 1815.

86. Preparation of any alkaline or Earthen Nitrate. To the person who shall prepare, in Great Britain, the largest quantity, not less than one hundred weight, of any salt of nitrid acid, with either earths or alkalies, by a method superior to, and as cheap as those hitherto practised; the gold medal, or one hundred guineas.

Certificates of the above quantity having been prepared, and a sample of not less than 28lb. to be produced to the Society on or before the last Tuesday in January, 1815.

87. Fine Bar Iron. To the person, in Great Britain, who shall make the greatest quantity of bar-iron, not less than ten tons, with coak, from coak pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel; the gold medal, or fifty guineas.

Samples, not less than one hundred weight, with *certificates* that the whole quantity is of equal quality, to be produced to the Society on or before the first Tuesday in January, 1815.

88. Preserving Iron from Rust. To the person who shall invent and discover to the Society a cheap composition, superior to any now in use, which shall effectually preserve wrought iron from rust; the gold medal, or fifty guineas.

A full description of the method of preparing the composition, with *certificates* that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society, with ten pounds weight of the composition, on or before the first Tuesday in January, 1815.

89. Refining Block Tin. To the person who shall discover to the Society the best method of purifying or refining block-tin, so as to render it fit for the finest purposes to which grain-tin is now applied, and not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so refined or purified, with a full detail of the process, and a quantity, not less than one hundred weight, of the tin so refined, to be produced to the Society on or before the first Tuesday in January, 1815.

90. Glazing Earthen-Ware without Lead. To the person who shall discover to the Society, the cheapest, safest, most durable, and most easily fusible composition, fit for the purpose of glazing the ordinary kinds of earthen-ware, without any preparation of lead, and superior to any hitherto in use; the gold medal, or thirty guineas.

Specimens of the ware so glazed, with proper *certificates* of its having succeeded, and a sample of the materials made use of, to be produced to the Society on or before the first Tuesday in February, 1815.

91. Cobalt, Zaffre, and Smalt. For the discovery of a mine of cobalt in Great Britain or Ireland, that will produce a sufficient quantity of the mineral, of good quality, to supply a manufacture of Zaffre or smalt; the gold medal, or thirty guineas.

Certificates that at least one ton of the ore has been raised; and five pounds of Zaffre, and ten pounds of Smalt made therefrom, to be produced to the Society on or before the last Tuesday in March, 1815.

N. B. It appears from the minutes of the Society, in 1755, that a discovery of cobalt was made at or near Truro in Cornwall, but not a sufficient quantity of ore found to answer the desired purpose.

92. Refining Copper from the Ore. To the person who shall discover to the Society the best method of separating, purifying, and refining copper from the ore, so as to render it fit for the finest purposes to which fine copper is now applied, and by a process superior to any hitherto known or in use, and not higher in price; the gold medal, or fifty guineas.

Certificates that not less than three tons have been so prepared or refined, and a quantity not less than one hundred weight of the copper so refined, to be produced to the Society, on or before the first Tuesday in February, 1815.

93. Mineralogical Map of England and Wales. To the person who shall complete and publish an accurate mineralogical map of England and Wales, on a scale of not less than ten miles to an inch, containing an account of the situation of the different mines therein, and describing the kinds of minerals thence produced; the gold medal, or fifty guineas.

Certificates of the accuracy of such map, together with the map, to be produced to the Society on or before the first Tuesday in February, 1815. The map to remain the property of the Society.

94. Mineralogical Map of Ireland. The same premium is offered for a mineralogical map of Ireland, on similar conditions.

95. Mineralogical Map of Scotland. The same premium is offered for a mineralogical map of Scotland, on similar conditions.

96. Natural History. To the author who shall publish, in the year 1814, the natural history of any county in the united kingdom; the gold medal, or fifty guineas.

It is required that the several natural productions, animal, vegetable, and mineral, peculiar to the county, or found therein, be carefully and scientifically arranged and described, in order that the public may be enabled to judge what arts or manufactures are most likely to succeed in such county. The work to be delivered to the Society on or before the last Tuesday in January, 1815, and a copy to be the property of the Society.

PREMIUMS IN POLITE ARTS.

97. HONORARY PREMIUMS FOR DRAWINGS BY NOBILITY. For the best original drawing of any kind, by young gentlemen under the age of twenty-one, sons, or grandsons of peers or peeresses in their own right, of Great Britain or Ireland; the gold medal.

98. For the best copy; the silver medal.

99—100. The same premiums will be given on the like conditions, to young ladies, daughters or grand-daughters of peers or peeresses in their own right, of Great Britain or Ireland.

101. HONORARY PREMIUMS FOR DRAWINGS BY GENTLEMEN. For the best original drawing of any kind, by young gentlemen under the age of twenty-one; the gold Isis medal.

102. For the best copy, the silver medal.

103—104. The same premiums will be given for drawings by young ladies.

N. B. As the foregoing honorary premiums are intended only for such of the nobility and gentry as may hereafter become patrons or patronesses of the arts; persons professing any branch of the polite arts, or any business dependent on the arts of design, or the sons and daughters of such persons, will not be admitted candidates in the above classes, including 97 to 104.

105. PEN DRAWING OF A HEAD. For the best pen drawing of the head of Homer, marked No. 33, in the British Museum, not less than twelve inches in height; the silver Isis medal.

106. DRAWINGS OF THE HAND AND FOOT. For the best drawing, with a pen, of the human hand and foot; the size of life or larger; the several parts marked with anatomical accuracy; the silver Isis medal.

107. DRAWINGS OF OUTLINES. For the best outline, after the plaster cast of the Apollo Belvidere, by persons of either sex, under the age of twenty-one, the figure not less than eighteen inches; the silver medal.

108. DRAWINGS. For the best finished drawing of the statue of the Discobolus, No. 34, in the British Museum; the size of the drawing not less than eighteen inches, by persons under twenty-one years of age; the silver medal.

N. B. Those artists who are inclined to make trial for the premiums in drawing of the Discobolus, or the head of Homer, (with permission of the trustees) at the British Museum, in the room marked X, may be informed by the Secretary, of the proper mode of applying for that permission.

109. PERSPECTIVE DRAWINGS OF MACHINES. For the best perspective drawings of machines, by persons under twenty-one years of age; the silver medal.

110. DRAWINGS OF LANDSCAPES. For the best drawings, in water colours, of a landscape after nature, not less than eighteen inches by twelve, by persons of either sex, under twenty-one years of age; the silver medal.

111. HISTORICAL DRAWINGS. For the best historical drawing, being an original composition of three or more human figures, the height of the principal figure not less than eight inches, by persons of either sex, under twenty-one years of age, the gold medal.

112. PREMIUMS FOR DRAWINGS IN GENERAL. For the best original drawing of any kind, by persons of either sex, under the age of twenty-one; the gold medal.

113. For the best copy; the silver medal.

114. ARCHITECTURAL DESIGNS. For the best original design of a national mausoleum for eminent military and naval heroes, consisting of plan, elevation, and section, the gold medallion; to be the size of double elephant, and the drawing to remain the property of the society.

115. For the next in merit the silver medallion, on similar conditions.

The following inscriptions to be engraved on these medallions; *The Premium given by the Society for the Encouragement of Arts, Manufactures, and Commerce, in conformity to the Will of John Stock, Esq. of Hampstead.*

116. PAINTINGS IN OIL. For the best painting in oil, of a landscape after nature, the size not less than thirty-six by twenty-eight inches; by persons of either sex, under twenty-five years of age; the gold Isis medal. Each candidate must mention whence the view was taken.

117. MARINE PAINTING. For the best original painting in oil of a marine subject, the size not less than thirty-six by twenty-eight inches, by persons of either sex, under twenty-five years of age, the gold Isis medal.

118. PLASTER CAST. For the best original model of a group, not less than three figures; the gold medal.

119. For a single figure, the silver medal on similar conditions.

A cast from the model to remain the property of the Society, and the principal figure to be one foot high.

120. BRONZES. For the best drapery figure or group cast in bronze; if a single figure, not less than twelve inches high, and if a group, not less than nine inches; and which will require the least additional labour to repair; the gold medal, or the silver medal and twenty guineas.

121. ETCHING OF AN HISTORICAL SUBJECT. For the best free etching in historical composition from a picture of eminence; the gold Isis medal.

122. ETCHING OF A LANDSCAPE. For the best free etching in landscape composition, from a picture of eminence; the silver medal.

123. HISTORICAL ENGRAVING. For the best finished engraving in historical composition; the gold medal.

124. LANDSCAPE ENGRAVING. For the best finished engraving in landscape composition, the gold Isis medal.

125. Engraving of a Portrait. For the best finished engraving of a portrait, the gold Isis medal.

N. B. In the class of finished engravings the Society require an aquafortis impression, and a finished proof to be sent, and to remain with the Society.

126. Engraving on Wood Blocks. For the best engraving on wood blocks of an historical subject, the size of the principal figure not less than six inches in height, and the block to be at least twelve inches by nine; the gold Isis medal.

Two or more impressions, with the block, to be produced to the Society. The impressions, but not the block, to remain the property of the Society.

127. Medal Die Engraving. For the best die engraving of one or more heads after the engraver's own model; the gold Isis medal.

128. For the best die engraving of one figure, or a group consisting of not more than three figures, after the engraver's own model; the gold medal.

The dies, with two impressions or casts, and the model, in each claim for medal die sinking, are to be produced to the Society. The impressions or casts, but not the model or die, to remain the property of the Society.

129. Black Lead Pencils. The silver medal is offered to the person who shall discover an effectual method of freeing black lead from impurity, and improving its quality, for the purposes of the arts.

N.B. The object of this premium is to obtain hard or soft pencils uniformly of a good quality.

CONDITIONS.

FOR THE POLITE ARTS.

No articles in the class of polite arts, whether for claims or bounties, are to be admitted into the Society after the first Tuesday in March, 1815.

No person who has gained the first premium in any class shall be admitted a candidate in a class of inferior age; and no candidate shall receive more than one premium in one year.

No person shall be admitted a candidate in any class, who has already obtained the first premium in that class.

No more than one performance in any class shall be received from the same candidate.

All performances (to which premiums or bounties are adjudged) shall remain with the Society until after the first Wednesday in June, 1815, when they will be re-delivered, unless mentioned in the premiums to the contrary.

No performance shall be admitted, that has obtained a reward from any other society, or academy, or been offered for that purpose.

It is required, that the matters for which premiums are offered, be delivered in without the names, or any intimation to whom they belong appearing; that each particular thing be marked in what manner each claimant thinks fit, such claimant sending with it a paper sealed up, having on the outside a corresponding mark, and on the inside the claimant's name, residence, and age; which paper is not to be opened, unless the candidate be successful, or by a special vote of the Society.

To encourage real merit; and prevent attempts to impose on the Society, by producing drawings made or retouched by any other person than the candidate, the Society require a specimen of the abilities of each successful candidate, to be made under the inspection of the committee of Polite Arts.

All candidates in the Polite Arts are required to signify, on their drawings, whether the performances are originals or copies; and to mark thereon the class for which each is intended, and if possible to send the originals from which copies are taken.

All copies of drawings, &c. are to be on a different scale from the original.

The Society reserve to themselves the power of giving in all cases such part only of any premium as the performance shall be judged to deserve; or withholding the whole, if there be no merit.

PREMIUMS FOR ENCOURAGING AND IMPROVING MANUFACTURES.

130. Employment of Females. To the person who shall instruct and employ the greatest number of females, not fewer than twenty, in the making of men's clothes, particularly of woollen cloth, and not being for the use of the army or navy; the gold medal, or fifty guineas.

Certificates that the number of women above-mentioned, have been constantly so employed for at least three months, to be produced to the Society, on or before the last Tuesday in March, 1815.

131. For the next greatest number of women so employed, not fewer than ten; the silver medal, or fifteen guineas, on similar conditions.

132. Cloth from Hop-Stalks, Nettles, &c. To the person who shall produce to the Society, the greatest quantity, not less than thirty yards of cloth, at least 27 inches wide, made in Great Britain or Ireland, of hop-stalks or bines, nettles, or other raw vegetable substances, the produce of Great Britain or Ireland, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap

as cloth of equal quality and appearance now made from hemp, flax, or cotton, and much finer in quality than any hitherto manufactured in England from hop stalks, &c.; the gold medal, or thirty guineas.

One pound of the thread of which the cloth is made, and thirty yards of the cloth, together with proper *certificates* that the whole is manufactured from hop-stalks, or bines, &c. to be produced to the Society on or before the last Tuesday in December, 1814.

N.B. The society is already in the possession of cloth made in England from hop-stalks or binés, and nettles, which may be inspected by application to the Housekeeper.

133. Sheep's Wool. To the person who shall prove to the Society, that he has sold the largest quantity of Merino wool, or such wool as will answer the same purposes, being the produce of his own flock, in the United Kingdom, for the purpose of being manufactured in superfine cloth, the quantity of wool not less than five hundred weight, in the year 1814; the gold medal.

Certificates, along with samples of the wool, and of cloth manufactured from it, to be produced to the Society on or before the last Tuesday in March, 1815.

134. For the next greatest quantity, not less than two hundred and fifty pounds; the silver medal, on similar conditions.

135. Hog's Bristles. To the person who shall prepare the greatest quantity of bristles, from swine bred in the united kingdom, equal in quality to those imported from Russia or Prussia, and at as cheap a rate; the silver medal, or fifteen guineas.

Certificates that not less than one hundred weight have been so prepared, and a sample of not less than fourteen pounds of such bristles, to be produced to the Society on before the last Tuesday in February, 1815.

136. Wicks for Candles or Lamps. To the person who shall discover to the Society, a method of manufacturing hop-stalks or bines, nettles, or any other cheap material, the growth of Great Britain, so as to render them equally fit for the purpose of supplying the place of cotton, for wicks of candles or lamps; the silver medal, or twenty guineas.

Samples, not less than five pounds weight, of the wick so prepared, to be produced to the Society on or before the last Tuesday in December, 1814, with *certificates* that the whole quantity is equal in quality to the sample.

137. Experiments to ascertain the proper Thickness of Wicks for Candles. To the person who shall make known to the Society the most satisfactory result of a series of experiments actually made by him to determine the best thickness of cotton wicks for candles, so as to obviate the defects of those commonly used; the silver medal, or ten guineas.

Certificates that not less than one hundred weight have been so made, and six pounds of the candles, to be produced to the Society, on or before the last Tuesday in February, 1815.

N.B. The intention in offering this premium, is to ascertain the proper thickness or bulk of the wick in proportion to that of the tallow, and to remove the unpleasant consequences and waste arising from the sparkling, or guttering, of the candles in common use.

138. Paper from raw Vegetable Substances. To the person who shall, between the first of January, 1814, and the first of January, 1815, make the greatest quantity, and of the best quality, (not less than ten reams) of good and useful paper, from raw vegetable substances, the produce of Great Britain or Ireland, of which one hundred weight has not been used in manufacturing paper previous to January, 1813, superior to any hitherto manufactured from such substances, and which can be generally afforded as cheap as paper of equal quality and appearance now made from rags; the silver medal, or twenty guineas.

N.B. The object of the Society being to add to the number and quantity of raw materials used in this manufacture, it is their wish to include every useful sort of paper, and to introduce such natural products as can be easily and cheaply procured in great quantities. The Society are in possession of two volumes containing a great variety of specimens of paper made from raw vegetable substances, viz. nettles, potatoe-haulm, poplar, hop-bines, &c. which volumes may be inspected by any person on application to the Housekeeper.

Certificates of the making such paper, and one ream of the paper, to be produced on or before the second Tuesday in January, 1815.

139. Transparent Paper. To the person who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and of a substance and body equal to foolscap that shall take and bear common writing-ink, with the same facility and correctness as writing paper generally in use; the silver medal, or twenty guineas.

Certificates of the making such paper, an *account* of the process, and one ream of the paper, to be produced on or before the second Tuesday in January, 1815.

140. Chintz Patterns for Calico-Printers. For the best original pattern in a new taste, of light and dark-ground chintz for garment work, or furniture, fit for the purposes of calico-printers, by persons of either sex; the silver medal. The pattern for which the premium is adjudged, to remain the property of the Society.

141. Copper-plate Patterns for Calico-Printers. For the best pattern, in a new style, fit for the purposes of calico-

printers for garment-work or furniture; the silver medal. The pattern for which the premium is adjudged, to remain the property of the society.

N.B. The patterns to be produced on or before the last Tuesday in February, 1815.

142. Gloves equal to French Kid. To the person who shall make known to the Society, a process equal to that of the French, or a superior one; for preparing, dying, and finishing the skins, verified by actual experiments, and the communication accompanied with at least a dozen pair of gloves made from skins so prepared in an equal or superior manner; the gold medal, or forty guineas.

Certificates from competent persons fully approving of the result of such experiments, together with the gloves and communication to be produced to the Society on or before the last Tuesday in March, 1815.

143. Improved Cat-Gut equal to Roman or Italian. To the person who shall discover to the Society the best method of manufacturing, in the United Kingdom of Great Britain and Ireland, the intestines of sheep, lambs, goats, or of any other animals, into the article called cat gut, equally strong, clear, smooth, even, and free from knots, as the best Roman and Italian strings, and at a price not exceeding what they are usually sold for in England; the gold medal, or thirty guineas.

Certificates that not less than fifty pounds weight have been so prepared by the claimant, with a full detail of the process, and samples of the article of various thicknesses, to be produced to the Society, on or before the first Tuesday in February, 1815.

144. For the next greatest quantity, not less than twenty-five pounds; the silver medal, or twenty guineas, on similar conditions.

PREMIUMS IN MECHANICS.

145. Gunpowder Mills. To the person who, in the year 1814, shall invent and bring to perfection the most effectual method of so conducting the works of gunpowder-mills in the business of making gunpowder, as to prevent explosion; the gold medal, or one hundred guineas.

Certificates and *accounts* of the method having been put in practice in one or more gun-powder mills in this kingdom, and that it promises, in the opinion of the best judges concerned in such works, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in Feb. 1815.

N.B. As an encouragement to persons to turn their thoughts to improvements of this nature, if any should be made on the present method of conducting the business of gunpowder making, which fall short of the total prevention of explosion, and they are sent to the Society for the sake of humanity, the papers so sent in will receive due consideration; and such bounty or reward will be bestowed as they may appear to merit.

146. Transit Instrument. To the person who shall invent and produce to the Society a cheap and portable transit instrument which may easily be converted into a zenith sector, capable of being accurately and expeditiously adjusted for the purpose of finding the latitudes and longitudes of places, and superior to any portable transit instrument now in use; the gold medal, or forty guineas.

To be produced on or before the last Tuesday in January, 1815.

147. Taking Whales by the Gun-Harpoon. To the person who, in the year 1814, shall strike the greatest number of whales, not fewer than three, with the gun-harpoon; ten guineas.

Certificates of the striking such whales, and that they were actually taken in the year 1814, signed by the master, or by the mate when the claim is made by the master, to be produced to the Society on or before the last Tuesday in December, 1814.

148. *This Premium is extended one year further, on similar conditions.*

149. Family Mill. To the person who shall invent and produce to the Society the best constructed mill for grinding corn for the use of private families, or parish poor; the construction to be such as to render the working of the mill easy and expeditious, and superior to any hitherto in use; the gold medal, or thirty guineas.

The mill, and *certificates* of its having been used to good effect, to be produced to the Society on or before the first Tuesday in February, 1815. Cheapness and simplicity will be considered as essential parts of its merit; and the mill or a model, to remain with the Society.

150. Machine for raising Coals, Ore, &c. &c. To the person who shall invent a machine for raising coals, ore, &c. from mines, superior to any hitherto known or in use; and which shall produce the effect at a less expense than those already known or in use; the gold medal, or fifty guineas.

A model of the machine, made on a scale of not less than one inch to a foot, with a *certificate* that a machine at large on the same construction, has been advantageously used, to be produced to the Society on or before the second Tuesday in Feb. 1815.

151. Improved Walking-Wheel, or Crane. To the person who shall invent an improved walking-wheel or crane, on which the weight or power of any person or persons shall be applied with the greatest safety and effect, and so contrived that the power can be varied according to the greater or less weight to be raised or lowered; the gold medal, or thirty guineas.

The model on a scale of not less than one inch to a foot, with a proper *certificate* that the machine at large has been employed to

good effect, to be produced to the Society on or before the second Tuesday in February, 1815.

152. MACHINE FOR RAISING WATER. To the person who shall invent a machine on a better, cheaper, and more simple construction than any hitherto known or in use for raising water out of wells, &c. from a depth of not less than fifty feet; the gold medal, or thirty guineas.

Certificates of the performance of the machine and a model of it, on a scale of not less than one inch to a foot, to be produced to the Society on or before the first Tuesday in February, 1815.

153. WATER PIPES. To the person who shall invent and discover to the Society a substitute for the elm pipes now in common use for the conveyance of water, which shall be cheaper, equally effectual, and more durable than any heretofore employed; the gold medal, or fifty guineas.

It is required that one of the pipes so employed, an accurate *account* of the method used, and every expense attending it, together with satisfactory accounts of its being effectual, to be delivered to the Society on or before the second Tuesday in January, 1815.

154. LAYING WOODEN PIPES. To the person who shall invent and discover to the Society a superior method of laying or connecting the wooden pipes now in use for conveying water, so as to lessen the injury they receive thereby; the silver medal, or twenty guineas.

It is required that a model, an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society, on or before the second Tuesday in January, 1815.

155. EXTINGUISHING FIRES. To the person who shall produce to the Society the best and most effectual method of procuring an immediate supply of water in case of fire, or for the means best calculated to prevent or extinguish accidental fires in buildings, superior to any now in use; the gold medal, or thirty guineas.

Certificates of the method having been practised with success, with a full description thereof, to be delivered to the Society on or before the second Tuesday in January, 1815.

156. BORING AND BLASTING ROCKS. To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, of boring or blasting rocks in mines, shafts, wells, &c.; the gold medal, or thirty guineas.

Certificates of the methods having been practised with success, with a full description thereof, to be delivered to the Society on or before the first Tuesday in January, 1815.

157. HEATING ROOMS FOR THE PURPOSE OF MANUFACTURERS. To the person who shall invent and discover to the Society a method of heating rooms, superior to any hitherto known or in use, and at a moderate expense, for the purpose of painters, japanners, and other manufacturers, so as to avoid the necessity of iron or copper tunnels going through the rooms to convey the smoke, whereby the danger from such tunnels may be prevented; the gold medal, or forty guineas.

A model or complete drawing and description of the method, with *certificates* that it has been successfully practised, to be delivered to the Society on or before the last Tuesday in March, 1815.

158. IMPROVED VENTILATION. To the person who shall invent and produce to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used; the gold medal or fifty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates*, to be delivered to the Society on or before the last Tuesday in February, 1815.

159. PREVENTING ACCIDENTS FROM HORSES FALLING WITH TWO-WHEELED CARRIAGES. To the person who shall invent and produce to the Society a method, superior to any hitherto known or in use, to prevent accidents from the falling of horses with two-wheeled carriages, especially on steep declivities; the silver medal, or fifteen guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, with proper *certificates* that the same has been used with success, to be delivered to the Society on or before the second Tuesday in January, 1815.

160. IMPROVING TURNPIKE AND OTHER ROADS. To the person who shall discover to the Society the most effectual and cheapest method, verified by actual experiments, of combining the materials ordinarily employed in making or repairing roads, so as to form them of the hardest consistency by their cementing properties, or by an artificial mixture of earth, stones, &c. altered by heat, or any other mode, so as to form an even, hard, and durable carriage-road; the gold medal, or thirty guineas.

It is required that an accurate *account* of the method used, and every expense attending it, together with satisfactory *certificates* of its being effectual, be delivered to the Society on or before the first Tuesday in March, 1815.

161. RAISING THE BODIES OF PERSONS WHO HAVE SUNK UNDER WATER. To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least

injury, the bodies of persons who have sunk under water; the gold medal, or thirty guineas.

The drag or machine, to answer the purpose intended, to be produced to the Society on or before the first Tuesday in March, 1815.

162. For preventing prejudicial Effects to the Persons employed in Pointing Needles. To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, by grinding them dry, during which the particles of grindstone-dust, and steel, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders; the gold medal, or thirty guineas.

A model of the apparatus, and a full *account* of the means by which the effect has been produced, together with proper *certificates* of its practicability and adoption, to be delivered to the Society on or before the second Tuesday in March, 1815.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE COMMERCE OF THE UNITED EMPIRE.

163. Taking Porpoises. To the people in any boat or vessel, who, in the year 1813, shall take the greatest number of porpoises on the coast of Great Britain or Ireland, by gun-harpoon, or any other method, not fewer than thirty, for the purpose of extracting oil from them; the gold medal, or thirty guineas.

Certificates of the number, signed by the persons to whom they have been sold or delivered for the purpose of extracting the oil, to be produced to the Society on or before the last Tuesday in January, 1815.

164. Oil from Porpoises. To the person who shall manufacture the greatest quantity of oil from porpoises taken on the coast of Great Britain or Ireland, in the year 1814, not less than twenty tons; the gold medal, or thirty guineas.

Certificates of the oil having been made from porpoises actually caught on the coast of Great Britain or Ireland, and two gallons of the oil as a sample, to be produced to the Society on or before the last Tuesday in February, 1815.

165. Curing Herrings. To the person or persons who shall, before January, 1815, cure the greatest quantity of white herrings, not less than thirty barrels, equal in all respects to the best Dutch herrings, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port; the gold medal, or fifty guineas.

166. For the next greatest quantity, not less than fifteen barrels; the silver medal or twenty guineas.

A sixteen gallon barrel of the herrings to be produced to the Society on or before the first Tuesday in February, 1815, with *certificates*, that the conditions of the premium have been fulfilled, and that the whole were cured in the same manner as the specimen, together with a full description of the process employed.

167. Curing Mackarel. To the person or persons who shall before January, 1815, cure the greatest quantity of mackerel not less in number than ten thousand, in the best manner and to the satisfaction of the Society, the same being caught in the British or Irish seas, and cured in a British or Irish vessel or port; the gold Isis medal, or twenty five guineas.

168. For the next greatest quantity, not less than five thousand; the silver medal or fifteen guineas.

A sixteen gallon barrel of the mackarel to be produced to the Society on or before the first Tuesday in January, 1815, with *certificates* that the conditions of the premiums have been fulfilled, and that the whole were cured in the same manner as the specimens, together with a full description of the process employed.

The same premiums to be extended one year further on similar conditions.

N. B. Specimens of cured mackarel which promise to afford a most valuable article of trade and food even superior to herrings, have been sent to the Society, and induced them to turn the attention of the public thereto, by offering the above premiums.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH COLONIES.

169. Nutmegs. For the greatest quantity of merchantable nutmegs, not less than ten pounds weight, being the growth of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, and equal to those imported from the islands of the East Indies; the gold medal, or fifty guineas.

Satisfactory *certificates*, from the governor or commander in chief, of the place of growth, with an *account* of the number of trees, their age, nearly the quantity of fruit on each tree, and the manner of culture, to be produced on or before the first Tuesday in January, 1815.

170. Kali for Barilia. To the person who shall have cultivated, in the Bahama-islands, or any other part of his Majesty's dominions in the West Indies, or any of the British settlements on the coast of Africa, or the several islands adjacent thereto, in the year 1813, the greatest quantity of land,

not less than two acres, with Spanish kali fit for the purpose of making barilla; the gold medal or thirty guineas.

171. For the next greatest quantity, not less than one acre; the silver medal, or fifteen guineas.

Certificates, signed by the governor or commander in chief for the time being, of the quantity of land so cultivated, and of the state of the plants at the time of signing such *certificates*, to be delivered to the Society, with samples of the kali, on or before the second Tuesday in January, 1815.

172. Destroying the Insect commonly called the Borer. To the person who shall discover to the Society an effectual method of destroying the insect commonly called the borer, which has of late years been so destructive to the sugar canes in the West-India islands, the British settlements on the coast of Africa, and the several islands adjacent thereto; the gold medal, or fifty guineas.

The discovery to be ascertained by satisfactory *certificates*, under the hand and seal of the governor or commander in chief for the time being, and of some other respectable persons, inhabitants of the islands, or other place, in which the remedy has been successfully applied; such *certificates* to be delivered to the Society on or before the first Tuesday in January, 1815.

173. Cultivation of Hemp in Upper Canada. To the person who shall sow with hemp the greatest quantity of land in the province of Upper Canada, not less than six arpents, (each four-fifths of a statute acre) in the year 1813, and shall at the proper season cause to be plucked the summer hemp, or male hemp bearing no seed, and continue the winter hemp, or female hemp bearing seed, on the ground until the seed is ripe; the gold medal, or one hundred dollars.

174. To the person who shall sow with hemp the next greatest quantity of land in the same province of Upper Canada, not less than five arpents, in the year 1813, in the manner above mentioned; the silver medal, or eighty dollars.

175. For the next greatest quantity of land, in the same province, and in a similar manner, not less than four arpents; sixty dollars.

176. For the next greatest quantity of land in the same province, and in a similar manner, not less than three arpents; forty dollars.

177. For the next greatest quantity of land in the same province, and in a similar manner, not less than one arpent; twenty dollars.

Certificates of the number of arpents, the method of culture, of the plucking of the hemp, with a general *account* whether sown broad-cast or in drills, the expense, soil, cultivation and produce, to be transmitted to the Society, certified under the hand and seal of the governor or lieutenant-governor, together with 28lb. of the hemp, and two quarts of the seed, on or before the last Tuesday in April, 1815.

178 to 182. In Lower Canada. Premiums exactly similar in all respects to those held out for the province of Upper Canada, are also offered to the Province of Lower Canada.

183 to 187. In Nova Scotia and New Brunswick. Similar premiums in all respects are also offered to the provinces of Nova Scotia and New Brunswick.

188. Importation of Hemp from Canada, Nova Scotia, and New Brunswick. To the master of that vessel which shall bring to this country the greatest quantity of marketable hemp, not less than one hundred tons, in the year 1814, the produce of Upper Canada, or of one of the above-mentioned provinces; the gold medal.

189. To the master of that vessel which shall bring the next quantity, not less than fifty tons; the silver medal.

Certificates satisfactory to the Society, to be produced by the master of the vessel on or before the first Tuesday in February, 1815, to testify that such hemp was grown and prepared in Canada, Nova Scotia, or New Brunswick.

190. Substitute for Hemp. To the person who, in the year 1814, shall discover and produce to the Society, a substitute for hemp, equally cheap, durable, and applicable to all the purposes for which hemp is now used; the gold medal or fifty guineas.

A quantity of the substitute, not less than one hundred weight, together with proper *certificates* from the governor or commander in chief, if raised in any of the British colonies, or from the Secretary of the Board of Trade, if raised in the East-Indies, to prove that the same has been used with success, to be produced to the Society on or before the last Tuesday in February, 1815.

N.B. The premiums for Nos. 169, *to* 190, *are all extended one year further, on similar conditions. Certificates to be produced at the same time of the year ensuing.*

191. Silk. For the greatest quantity of silk proper for manufactures, not less than one hundred pounds weight produced by any person in Malta, or islands near or adjacent thereto, in the possession of Great Britain, in the year 1814, from silk-worms bred there; the gold medal, or fifty guineas.

Specimens of the silk, not less than one pound, with an *account* of the method in which the silk-worms were managed; the kind and size of the mulberry trees from whence they were furnished with food, and particulars respecting the culture of the mulberry trees for that purpose, to be produced to the Society on or before the first Tuesday in March, 1815.

192. For the next greatest quantity, not less than fifty pounds, on similar conditions; the silver medal, or twenty guineas.

Satisfactory *certificates* from the governor or commander in chief of the district where the said silk was produced, and of the several particulars above-mentioned, to be delivered to the Society along with the samples required.

N. B. The same premiums, on similar conditions, will be given for silk produced in the years 1815 and 1816, *certificates* to be sent at the same time of the years ensuing.

PREMIUMS OFFERED FOR THE ADVANTAGE OF THE BRITISH SETTLEMENTS IN THE EAST INDIES.

193. Bhaugulpore Cotton. To the person who shall import into the port of London, in the year 1814, the greatest quantity, not less than one ton, of the Bhaugulpore cotton, from which cloths are made in imitation of nankeen, without dyeing; the gold medal.

A quantity of the cotton, not less than five pounds weight, in the pod, and five pounds carded, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of Bengal or Bombay, on or before the last Tuesday in February, 1815.

194. Annatto. To the person who in the year 1814, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of annatto, not less than five hundred weight; the gold medal.

A quantity of the annatto, not less than ten pounds weight, to be produced to the Society, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the annatto is the produce of such settlement, on or before the last Tuesday in February, 1815.

195. True Cochineal. To the person who, in the year 1814, shall import into the port of London, from any part of the British settlements in the East Indies, the greatest quantity of true cochineal, not less than three hundred weight; the gold medal.

A quantity of the cochineal, not less than three pounds weight, with proper *certificates*, signed by the Secretary of the Board of Trade of the respective settlement, that the cochineal is the produce of such settlement, to be produced to the Society on or before the first Tuesday in February, 1815.

N.B. The Premiums from No. 193 *to* 195 *inclusive, are all extended two years further on similar conditions. Certificates to be produced at the same time of the years ensuing.*

GENERAL CONDITIONS.

AS the great object of the Society in rewarding individuals is to draw forth and give currency to those inventions and improvements, which are likely to benefit the public at large, candidates are requested to observe, that if the *means*, by which the respective objects are effected, do require an expense or trouble too great for *general purposes*, the Society will not consider itself as bound to give the offered *reward*; but, though it thus reserves the power of giving in all cases such part only of any premium as the performance shall be adjudged to deserve, or of withholding the whole if there be no merit, yet the candidates may be assured the Society will always judge liberally of their several claims.

All candidates are to take notice, that no claim for a premium will be attended to, unless the conditions of the advertisement are fully complied with.

All models of machines, which obtain premiums or bounties, shall be the property of the Society; and, where a premium or bounty is given for any machine, a perfect model and description thereof shall be given to the Society.

All the premiums of this Society are designed for Great Britain and Ireland, unless expressly mentioned to the contrary.

The claims shall be determined as soon as possible after the delivery of the specimens.

It is expected that all articles for claims or bounties be sent to the Society, carriage paid.

No person shall receive any premium, bounty, or encouragement, from the Society, for any matter for which he has obtained, or purposes to obtain, a patent, or for which he has obtained, or expects any premium or reward from any other Society.

A candidate for a premium, or a person applying for a bounty, being detected in any disingenuous method to impose on the Society, shall forfeit such bounty, and be deemed incapable of obtaining any for the future.

No member of this Society shall be a candidate for, or entitled to receive, any premium, bounty, or reward whatsoever, except the honorary medal of the Society. The candidates are, in all cases, expected to furnish a particular account of the subject of their

claims; and where certificates are required to be produced in claim of premiums, they should be expressed, as nearly as possible, in the words of the respective advertisements and be signed by disinterested persons who have a positive knowledge of the facts stated.

Where premiums or bounties are obtained in consequence of specimens produced, the Society mean to retain such part of those specimens as they may judge necessary, making a reasonable allowance for the same.

No candidate, not a member, shall be present at any meeting of the Society or Committees, or admitted at the Society's rooms, after they have delivered in their claims, until such claims are adjudged, unless summoned by the Committee.

The Society, anxious to promote the Arts of their country, have adopted the resolution of forming a Collection of Prints, to be open for public inspection; and, having arranged those already in their possession, invite engravers to send etched or finished proofs of their plates; and hope that amateurs, collectors, and publishers of works of art, will also contribute to the undertaking.

Prints of machines, or maps, will also come within the above arrangement.

The Society further invite the communications of scientific and practical men, upon all subjects connected with the views of the Society, although their experiments may have been conducted upon a smaller scale than the terms required by the premiums; as such communications may afford ground for more extensive application, and thus materially contribute to the advantage of the public.

The Library of the Society, which has already become very valuable, may yet receive considerable additions and improvements from the presents of members, or other persons who may be inclined to place useful books or valuable manuscripts in a repository, at once permanent and conducive to the national benefit.

All communications are to be made by letter, addressed to CHARLES TAYLOR, M. D. the Secretary, *at the Society of Arts, &c. Adelphi, London.*

And where articles are sent by Sea for the Society, the Bills of Lading are to be addressed to the care of WILLIAM VAUGHAN, Esq. *Mincing-lane, London,* who has politely undertaken to receive them for the Society.

The Winchester bushel is the measure referred to for grain; and, as the acres of different districts vary in extent, it is necessary to observe, that the Society mean Statute Acres of five and a half yards to the rod or pole, when acres are mentioned in their list of premiums; and they request that all communications to them may be made agreeably thereto.

The Society desire that the Papers on different subjects sent to them may be full, clear, and explicit, fit for publication, and rather in the form of Essays than of Letters: and that descriptive Drawings may be sent, with the Models and Machines laid before the Society.

*** To persons inclined to leave a sum of money to this Society by will, the following form is offered for that purpose.

Item. I give and bequeath to A. B. and C. D. the sum of upon condition and to the intent that they, or one of them, do pay the same to the Collector, for the time being, of a Society in London, who now call themselves the Society for the Encouragement of Arts, Manufactures, and Commerce; which said sum of I will and desire may be paid out of my personal estate, and applied towards the carrying on the laudable designs of the Society.

N. B. The Society considering that it would be beneficial to the Commerce of the United Kingdom to bring the British Marbles into more general use, and that the most effectual method of accomplishing their object would be, for the present, *to make them more generally known in the capital, have come to the following resolutions:—*

Resolved.—That specimens of British Marbles be exposed in the Society's Rooms, in the Adelphi, for the inspection of the public, under the following regulations:

1st. That all the specimens be exact to a given size, *viz.* eight inches high, six inches broad, one inch thick, and polished on one face.

2. That a book be kept, containing the number of each specimen, and describing the situation of the quarry, the name of the parish where situated, the distance of the quarry from a beaten road, and the distance of that road from water-carriage, with the name of the donor and proprietor. Any remarks on the qualities of the marbles, or on the lime produced from them, will be gratefully received and preserved by the Society, as materials for future inquiries.

Resolved,—That as the exertions of the Society can be generally beneficial, only inasmuch as their views are seconded by the public, the Society request, that all persons proprietors of marble quarries, will favour them with a specimen of the marble, worked to the exact size above mentioned, with the description of the quarry as above, that the same may be entered in the book to be preserved for the use of the public. By such arrangements, it is expected that the interest of the proprietors of the quarries will be promoted, and the use of British marble much extended. A variety are already exhibited in the Society's Room.

The Society take this opportunity of returning their thanks to the several Societies and Individuals, who have favoured them with presents for their Repository and Library.

Premiums and Rewards bestowed by the Society of Arts, Manufactures and Commerce, Adelphi, during their Session, which commenced on the fourth Wednesday in October, 1813, and closed on the 1st. of June, 1814.

ON Tuesday the 31st. of May, his Grace the DUKE of NORFOLK, the President, distributed the Rewards then adjudged.

IN AGRICULTURE.

To William Liddell, Esquire, of Kildy Grange, near Pickering, Yorkshire, for planting oaks, class 3; the gold medal.

To Thomas H. Scott, Esq. Wimpsen, near Southampton, for plantations and improvement of lands; the gold Ceres medal.

To Godfrey Higgins, Esquire, Skellow Grange, near Doncaster, for improving 180 acres of waste land, class 44; the gold medal.

To Mr. Edward Backhouse, of Darlington, Durham, for planting 363,600 larches, class 10, the gold medal.

To Mr. Leonard Phillips, Jun. Portsmouth road, beyond Vauxhall turnpike, for the culture and application of the plant mangel wurzel; the gold Ceres medal.

To Miss Ann Clague, Nicholas Street, Chester, for her method of procuring the early growth of potatoes; the silver Ceres medal.

To Mr. James Wilkinson, of Elsted, near Godalmin, for a turn-rise plough, the silver medal and ten guineas.

To Mr. James Braby, Vine Street, Pedlar's Acre, for an improved cart and drag, five guineas.

IN POLITE ARTS.

To William Peart, Esq. at the Rev. George Porter's, Billericay, Essex, for an original drawing of fruit and flowers, class 101; the gold medal.

To W. H. Harriott, Esq. West Hall, Mortlake, for an original landscape, from the Lady of the Lake; the gold Isis medal.

To Miss Eliza Phillips, of Wandsworth Road, for an original landscape; the silver medal.

To Miss Mary Ann Say, Norton Street, Mary-le-bone, for a drawing of the three Marys, a copy, class 110: the silver medal.

To Miss M. Sheppard, of Uley, Glouces. tershire, for a drawing of the Silence, a copy, the silver medal.

To Henry Kew, Esq. New Palace Yard, Westminster, for a camel's hair pencil drawing of a battle, a copy, class 102; the silver medal set in gold.

To Mr. George Phillips, Wandsworth road, for an original design of the interior of a gothic mausoleum, class 109; the gold medal.

To Miss Harriet Page, Chiswick, for an original drawing of flowers; the silver palette.

To Miss Sophia Page, Chiswick, for a drawing of flowers; the silver palette.

To Henry Parke, Esq. Dean Street, Soho, for an original marine painting, class 114; the gold Isis medal.

To Mr. Henry Ziegler, at Mr. Varley's, Broad Street, for an oil painting of the Death of Procris; the silver Isis medal.

To Miss Margaret Geddes, Maddox-street, Hanover square, for an original oil painting of a lady and dove; the gold medal.

To Miss Elizabeth Halstead, of Manchester, for an oil painting of fruit and flowers, class 104; the silver medal.

To Mr. William Theobald, Skinner Street Snow hill, for an oil painting of a celebrated poney, the silver palette.

To Master T. Landseer, Foley Street, Portland Chapel, for an oil painting of a farmer's horse, the silver Isis medal.

To Miss Emma Eleonora Kendrick, Upper Mary-le-bone Street, for an original figurative miniature of Religion, the gold Isis medal.

To Miss Mary Allen, Half Moon Street, Piccadilly, for an original miniature of her brother, the silver Isis medal.

To Master John Hayter, Wells Street, Oxford Road, for a pencil outline of the laacoon; the silver palette.

To Mr. William Behnes, Iron Gate Tower, for an outline of the gladiator Repellens; the silver Isis medal.

To Mr. Thomas Smith Cafe, Wigmore Street, Cavendish Square, for an outline of the gladiator Repellens, class 105; the silver medal.

To Miss Whissen, at Mrs. Kennards, Covent Garden, for an original drawing of a wild rose; the silver medal.

To Miss Henrietta Sutherland, Sloane Square, for a drawing of a tree, a copy, the silver palette.

To Mr. James Robertson, Great Chesterfield Street, for a landscape, a copy; the silver palette.

To Mr. Charles Russel, Warwick Street, Golden Square, for a drawing of an old soldier, a copy; the silver palette.

To Mr. Frederick Harding, Hunter Street, Brunswick Square, for a drawing of a captive, a copy; the silver Isis medal.

To Samuel Cousins, St. Mary Steps, Exeter, for a drawing of a Magdalen, a copy; the silver Isis Medal.

To Miss Francis Sievier, Lambs Conduit Street, for a head of King Richard, a copy; the silver palette.

To Miss E. A. Ensor, College Street, Camden Town, for a drawing of a landscape; the silver palette.

To Mr. John Whitehead, New road, Fitzroy Square, for a plaster cast of Æneas flying from Troy; the silver palette.

To Mr. William Wyon, Birmingham, for a medal die, emblematical of our naval victories; the gold medal.

To Mr. Caleb Hedgeland, Exeter, for executing a model of Exeter Cathedral; the silver Isis medal.

To Miss M. E. Tomkins, New Bond street, for a drawing of the head of Hercules, a copy; the silver Isis medal,

To Miss S. M. Tomkins, New Bond Street, for a drawing of the head of Ariadne, a copy; the silver pallette.

To Master F. Y. Hurlstone, King Street, Covent Garden, for the drawing of the plague stayed, a copy; the silver Isis medal.

To Master Edwin Landseer, Foley Street, Portland Chapel, for a drawing of a hunting horse; the silver Isis medal.

To Master A. T. Roffe, Ossulton Street, Somer's Town, for an academical drawing, a copy; the silver Isis medal.

To Mr. Wm. James Ward, Buckingham Place, Fitzroy Square, for a pen and ink drawing of the holy family; the silver Isis medal.

To Mr. John Turner, Whitchurch, Shropshire, for an original design for a church, Class 117, the silver medallion, *in conformity to the will of the late John Stock, Esq. of Hampstead.*

To Miss Mary Ann Moore, Judd Street, Brunswick Square, for a drawing of sea shells from nature; the silver pallette.

To Miss Maria Burdett, Bridge Street, Westminster, for a drawing of Larghnor castle, a copy; the silver Isis medal.

To Mr. E. Bocquet, Paradise Row, Lambeth, for an engraving of a portrait; the silver Isis medal.

To Mr. T. Ranson, Judd's Place West, Somer's Town, for an engraving of a portrait; the silver medal.

To Mr. Thomas Cheesman, Newman Street, Oxford Road, for an engraving of the plague stayed on the repentance of David; the gold Isis medal.

IN MANUFACTURES.

To Mr. S. Marshall, Streatham, for a calico printer's block; the silver Isis medal, and ten guineas.

IN MECHANICS.

To Mr. William Hookey, Woolwich, for bending straight timber, for building large ships of war; the gold medal.

To Mr. George Scott, George Street, Tower Hill, for uniting the standing rigging of ships broken in action; the gold Isis medal.

To Mr. William Horn, Chatham, for a machine for cutting canvas for ship's riggers; the silver medal.

To Mr. Peter Hedderwick, Lower East Smithfield, for a double piston pump, yielding double the usual quantity of water from the same bore; the silver medal and twenty guineas.

To Mr. Thomas Boyce, Dean Street, Fetter Lane, for a life boat or safety buoy; the silver medal and ten guineas.

To Mr. T. Cleghorn, Old Hall Green, near Ware, for a buoyant line, to preserve the lives of mariners; the silver medal.

To Mr. Peter Nicholson, Oxford Street, for preparing and squaring wreathed hand rails; the gold Isis medal.

To Mr. Peter Nicholson, Oxford Street, for an instrument called a centro-linead, useful for drawing in perspective; twenty guineas.

To Mr. J. Farey, jun. Crown Street, Westminster, for an instrument useful in perspective drawings; the silver medal.

To Mr. Edmund Turrell, Gee Street, Clarendon Square, for an instrument named by him a perspectograph, by which even difficult objects may be drawn with great accuracy and ease; the silver medal.

To Mr. L. Byron, Princes Square, St. Georges's East, for a sinical octant, for taking altitudes; the silver Isis medal.

To Mr. M. Levien, Pleasant Row, Pentonville, for his improvements on the harp guitar, which enables the performer to play in all the various keys, with ease, effect, and facility; ten guineas.

To Mr. F. Folsch, Oxford Street, for facilitating reading and writing; the gold Isis medal.

To Mr. Thomas Keyworth, Sleaford, Lincolnshire, for instructing poor children to write in a cheap and easy manner; five guineas.

To Mr Henry Ward, Blandford, for an equation work for a clock; the silver medal and five guineas.

To Mr. William Martin, High Street, Mary le-bone, for a machine to weigh various articles; the silver Isis medal and 10 guineas.

To Mr. Charles Drury, of Mansfield, for a method of feeding horres when travelling or standing in the street; the silver isis medal.

To Mr. Charles Williams, Hatfield Street, Blackfriars Road, for a portable corn mill for family use; the silver medal and twenty guineas.

To Mr. James Stone, Warwick Street, Golden Square, for a double spring to a door enabling it to open inwards or outwards; the silver medal and five guineas.

To Mr. Charles Wilson, Worcester Street, Borough, for a sash window which can be cleaned or painted without danger to the person employed; five guineas.

To Mr. John Woodall, London Wall, for a wind-up bedstead for sick or lame persons, by which their position can be easily altered without occasioning pain or fatigue; the silver medal.

IN COLONIES AND TRADE.

To Mr. H. E. Sievers, Lower Thames Street, for herrings caught in the British Seas, and cured in the Dutch manner; the gold Isis medal.

To Dr. William Roxburgh, M. D. Botanic Garden, Calcutta, for important communications on the different products of the East Indies, and their several applications to the arts, manufactures, and commerce of the United Empire; the gold Ceres medal.

*** *The Public are requested to guard against imposition, from persons advertising or pretending to have patents, for articles rewarded by the Society. It is a stipulated condition, that all persons who receive premiums, or bounties, from the Society, shall relinquish all pretensions to a patent for articles so rewarded, and shall allow them to be made by any person whatever.*

The Public are also cautioned against purchasing articles sold under a pretended sanction of the Society's name. Information may be had, by enquiry at the Society's House, whether the advertised articles are, or are not, deceptions upon the Public.

*** Since the last Distribution of Rewards, SEVENTY-SEVEN new Members have been elected.

THE LIST of PREMIUMS offered, may be had, *gratis*, at the Society's House in the Adelphi. By Order of the Society,

June, 1814. CHARLES TAYLOR, M.D. Secretary.

N. B. Where errors have arisen in the address of any Member of the Society, information is desired to be given to Mr. R. Elwin, the Collector, at the Society's House in the Adelphi, who receives the Subscriptions from the Members, and furnishes Receipts for the same.

Lately was published, Price 10*s.* 6*d.*

THE THIRTY-FIRST VOLUME of the SOCIETY'S TRANSACTIONS, which may be had from the Housekeeper, at the Society's House in the Adelphi. Also complete Sets of their Transactions, or any single Volume.

Also, An ANALYTICAL INDEX of the FIRST TWENTY-FIVE VOLUMES of the TRANSACTIONS of the SOCIETY, to the Termination of their Session, June, 1807, price 5s.

A CATALOGUE of the BOOKS in the Society's Library may be procured as above, price One Shilling, along with an Appendix thereto.

PAPERS

IN

AGRICULTURE.

The GOLD MEDAL, *the Premium offered in Class 3, was this Session adjudged to* WILLIAM LIDDELL, *Esq. of Kildy Grange, near Pickering, Yorkshire, for planting* 8000 *Oaks. The following Communications were received from him.*

SIR,

INCLOSED I have the pleasure to send you certificates of 8000 oaks which I planted on my estate at this place in 1811, along with other trees, on forty-seven acres of moor land, which is fenced with a stone wall five-and-a-half feet high.

The plants appear in a thriving state, I therefore beg leave to apply for the Medal of the Society as offered in Class 3.

The land composing this estate was nearly in a state of nature at the period of my purchase, the fee simple of which did not exceed fifty shillings per acre. The very

flourishing condition of my plantations has already attracted the notice of strangers, and induced gentlemen fond of rural improvements to follow an example which bids fair to reward the adventurer with profit. The land adjoining, indeed, at present obtains an advanced price, and I feel confident, that the shelter produced by the growing wood, the facility in obtaining fences, and the ameliorated climate, will, in the course of a few years, enable this land to yield a considerable quantity of corn, and afford the means of rearing numerous herds of cattle. The quantity of moor-land, bearing the name of Kildy Grange, comprises about five hundred acres.

I am, with respect,

Sir,

Your most obedient servant,

WILLIAM LIDDELL.

Hull, Dec. 31st. 1813.

To C. Taylor, M. D. Sec.

Certificates.

This is to certify, that Mr. William Liddell, of Hull, hath planted in the high intach on his estate at Kildy Grange, in the year 1811, eight thousand oaks, with other forest trees, on forty-seven acres of moor land; which plantation we have frequently seen, and it appears at present in a healthy and thriving state, as witness our hands this 29th day of December, 1813,

Thomas Hayes, Minister of Ellerton.
James Green, of Cropson.
William Yeoman, of Pickering.
Francis Kirby, of Pickering.

A CERTIFICATE was also received from Mr. Jonathan Noah Sleed, gardener and planter, of Bracklesby, near Brigg, Lincolnshire, stating, that he had planted the said land for Mr. Liddell, and that he visited the plantation in the years 1812 and 1813; that the trees appear in a healthy thriving state, well fenced with a stone wall; that the land had a number of small drains to carry off the top water.

The GOLD MEDAL, *the Premium offered in Class 44, was this Session adjudged to* GODFREY HIGGINS, *Esq. of Skellow Grange, near Doncaster, for improving one hundred and eighty Acres of Waste Land. The following Communications were received from him.*

SIR,

HEREWITH I enclose an account of the improvements which I have completed upon my estate in the parish of Arncliff, in Craven, in this county, at the foot of Mount Pennagent, and not far from that estate of Major Hesleden, for improvements upon which he gained the Society's premium last year.

The land, when I commenced my improvements, was lying open to the extensive moors of Horton and Cosh, had never been cultivated. The person who possessed the property before me, had fenced part, but the most difficult parts over the peat mosses had not been attempted.

The surface of the ground was of various kinds, as peat, rushes, ling, and coarse white grass; a few half-starved sheep pastured thereon, whose wool formed the sole profit of the farmer.

The soil was as various as the surface, but so wet and boggy, that it was impossible to ride over it, and generally consisted of a good strong hazel loam, and rotten black bog earth.

The first thing necessary to be done was to lay the land dry; and after I had effected that object tolerably well, I commenced covering it with lime, laying on after the rate of one hundred horse-loads of lime, or three hundred bushels, on each acre. In draining land of this description, it is very difficult to discover all the springs at first; and from my residing at a considerable distance from the place, and having a very negligent tenant, the springs remain in some few places, and some of the drains have not been so well connected as they ought; so that I believe I shall have one hundred and fifty or two hundred roods of draining to do next spring to make it perfect and complete, though I can now ride in safety over the whole.

The land is all in grass, and I apprehend must always continue so, as corn will not ripen on these exposed hills. When I have finished the small quantity of draining above mentioned, I conceive that I shall have no difficulty in letting it on an average on lease for twelve years at a guinea per acre.

If I had the farm to let, the increased rent would not be a bad criterion by which to form a judgment of the value; but I leave the old rent as it was, and, by agreement, charge the tenant with one shilling and sixpence additional rent for every pound expended.

Land,

Land, under this management, is three years at least before it arrives at any considerable degree of perfection; the coarse grass and rushes gradually disappearing, and giving place to a very beautiful herbage, amongst which the white clover and sheeps' fescue grass take a distinguished place, and as rain falls here nearly every day, it is never parched.

The walls are of rough stone, three feet four inches wide at bottom, and six feet high, with twenty-one bonding stones in each rood of seven yards in length.

The drains are in depth from two to three feet: some are made of stone, walled on each side, and covered with flat stones; in other places, the drains are made by filling the trenches with loose stones to the top.

I have built an entire new barn for hay, and erected some other useful buildings.

The land drained measures rather more than one hundred and eighty acres, but only about one hundred and forty of them are limed. What is not yet limed, I call only half done. The whole is now enclosed with walls, and is in two closes.

The tenant told me he sold his butter from the first limed pasture, the last summer, at three guineas the firkin, or six guineas the hundred weight. He had a number of very fine cows upon it.

Adjoining this ground is an extensive moor of good land, but totally unimproved. I have at length persuaded my neighbours, after many years of dispute, to refer the division of it to a single person, without an act of parliament (viz. Mr. Geldart, of Coppleside, near Settle), who has already commenced his operations. I shall be entitled to a great part of it; and as it is my present intention to improve every acre of it, the Society will probably

hear from me again at a future day, if my present labours meet its approbation.

I remain,

Sir,

Your most obedient humble servant,

GODFREY HIGGINS.

Shallow Grange, near Doncaster,
January 7th, 1814.

To C. Taylor, M. D. Sec.

An account of cash expended in improving the farm at Foxup, the property of G. Higgins, Esq.

Back Pasture.	£	s.	d.
Stone drains, 2,556 roods, at 1s. 8d. per rood,	213	0	0
Ditto, 343 ditto, at 1s. 9d. per ditto,	30	0	0
Additional drains not measured off - -	9	0	0
Sod drains, 352 roods, at 6½d. - -	9	10	8
Brigill and Horrop.			
Stone drains, 1,990 roods, at 1s. 9d. -	174	2	6
Ditto, 652 ditto, at 1s. 9d. -	57	1	8
Ditto large, 19 ditto, at 2s. 3d. -	2	2	9
Sod drains, 49 ditto, at 6½d. -	1	6	6
Ditto, 1,388 ditto, at 6½d. -	37	11	10
Stone drains, 224 ditto, at 1s. 9d. -	19	12	0
Sod ditto, 152 ditto, at 6½d. -	4	1	0
	£557	8	11
Fence walls, 137 roods, at 10s. 6d. -	71	18	6
Ditto, 103 ditto, at 5d. -	25	18	11
Ditto, 51 ditto, at 14s. 6d. -	36	19	6
	£692	5	10

Lime

Lime in Back Pasture, 8,329 loads, at 7½d.				213	0 0
Ditto loading out, at 2½d. - -				86	15 2½
Ditto spreading, at 3s. 2d. per cwt. -				13	3 9
Lime in Harrop, 6,000 loads, at 8½d. -				212	10 0
Ditto carrying out, at 3¼d. per load,	81	5	0	83	0 0
Ditto - - -	1	15	0		
Spreading out, at 3s. 2d. per cwt. -				8	18 0
				£1,309	12 9½
Various extra expences of cottages, farm-house repairs, new hay-barn, building and walling, &c. - - - -				385	18 1½
				£1,695	10 11

Certificates.

We whose names are subscribed declare, that we have seen the land and improvements of which the above is a description, and the account accompanying it, which we believe to be correct.

Matthew Wilson, Acting Magistrate of the West Riding of Yorkshire.

Thomas Lindley, Curate of Haltengill Chapel, in the parish of Arncliffe.

John Wildman, Chief Constable for the East Division of Arncliffe.

The GOLD MEDAL *of the Society offered in Class 10, was this Session adjudged to Mr.* EDWARD BACKHOUSE, *of Darlington, for planting* 363,600 *Larches. The following Communication was received from him.*

RESPECTED FRIEND,

BEING desirous of becoming a candidate for the premium, offered by the Society of Arts under Class 10, I take the liberty of enclosing certificates of the extent of the plantations I made in the winter of 1810-11; and should any further documents be wanting, I shall endeavour, if possible, to supply them.

The estate on which these trees have been planted, has a north aspect, and principally forms one side of a rugged hill; and, excepting a few acres (about four or five, and these very poor), the land planted is not at all calculated for the purposes of husbandry, being unlevel ground, and generally of a stony barren nature, covered with heath.

The trees are certainly flourishing, excepting where any bog or wet place occurs; and where this is the case, open drains have in some instances been made, and in others, where larches have not been found to thrive, trees suitable to such situations have been planted, viz. alder, birch, silver and Scotch firs, and willows. What failures have occurred, have been generally filled up every season.

Holes were made for the trees of about eighteen inches square, and from four to four and a half feet from each other;

other; and the soil thrown out of these before winter, got well mellowed before the plants were put in.

I remain very respectfully,

EDWARD BACKHOUSE.

Darlington, 14, 12*th Month*, 1813.

To C. Taylor, M. D. Sec.

Certificates.

I do hereby certify, that I have superintended the planting of three hundred and sixty-three thousand six hundred larches, and sixty-seven thousand other timber trees, at St. John's, in the parish of Walsingham, in the county of Durham, by order, and on behalf of, Edward Backhouse, of Darlington, in the said county.

The said trees were all planted between the 24th of June, 1810, and the 24th of June, 1811, and cover one hundred and ninety-seven acres of land, not calculated for the purposes of husbandry. The said plantations are effectually fenced and secured, and the plants in a thriving condition. Witness my hand, this 6th day of December, 1813,

James Thompson.

I do hereby certify, that I surveyed the within-mentioned estate of St. John's, near Walsingham, and found the contents of the plantations to be one hundred and ninety-seven acres, two roods, and one perch, which are very completely planted with larches, and some other trees intermixed, and that the above report of their thriving condition, and being well fenced, is true. Witness my hand this 7th day of December, 1813,

Edw. Charlton, Land Surveyor.

The

The Gold Ceres Medal was this Session voted to THOMAS H. SCOTT, *Esq. of Wimpson, near Southampton, for his Improvements of Waste Land. The following Communications were received from him.*

SIR,

IN the autumn of 1808, I employed Mr. John Ross, Land Surveyor of Wimpson, to purchase for me a tract of waste land consisting of about two hundred and twenty acres, which had been inclosed a few years, but the embankments were almost destroyed through neglect. There had been about ten or twelve acres broken up and cropped with oats for three successive years, without any other manure than the ashes for the first crop. This land with great labour and expense I dunged, and obtained a very good crop of oats and seeds. I pursued the mode of paring and burning with the rest of the land, and had a crop of turnips which were fed off by sheep, and then sowed it with oats and seeds. It was suffered to lay one year in grass, and was then ploughed up and manured with oil-cake, at an expence of about five pounds per acre, and with great expedition sown with wheat, and the following season with barley, and produced most excellent crops. At the end of the year 1812, I had brought into cultivation about one hundred and seventy acres, which I had repeated offers from farmers to rent from me on a lease of twenty-one years.

The land (all but about fifty-four acres, which was divided from the rest and planted by me with larch, Scotch firs, &c.) was a clay loam, and a large portion of a thin

a thin staple; but by proper management, and laying chalk on the whole, at an expense of nearly twelve pounds per acre, I succeeded in bringing it to its present state, and the first crop of corn after the chalk paid the expenses attending it.

One part of the land when purchased, was quite unfit for cultivation of corn, it being an entire bed of gravel, it consisted of about fifty-four acres which I prepared during the winter for planting, by digging holes about a foot square, at a yard apart, laying the gravel loose to receive the benefit of the winter frost.

In the spring following I employed a number of hands, and planted it with as much expedition as possible, and I succeeded in getting the whole finished by April. As I had agreed with a nurseryman to plant by the acre, I had nothing to do with replacing those which died during three seasons, including the first of planting.

In the autumn of 1811, when I took the plantation in hand, I found a deficiency only of about eight thousand, and from repeated observations, I found that the larch thrived be stwhere the gravel was deeper, and further from a subsoil of clay, as well as the Scotch-fir, in proportion of nearly one-fifth, and where the ground had been previouly loosened by old gravel-pits, &c. and quite free from heath, the plants were healthier and made much greater progress; from which circumstances, as well as other remarks, I would recommend, that the heath should first be taken off with a paring plough, and the whole ground loosened, rather than to dig holes in the land without previous preparation. I leave to the judgment of others, from circumstances, to consider the propriety of burning the heath and ploughing in the ashes for a crop of potatoes.

In

In another plantation, which I am about to prepare next spring, I shall try the experiment on about twenty-four acres. The probable expense of both ploughings, would not be more than forty or fifty shillings per acre, and the operation of either digging or ploughing up the crop, would leave the land sufficiently loose for planting trees.

In the course of twenty years the second thinning would, on a very low calculation, average two shillings each tree, and one-half being in that time taken away, would yield (allowing the odd seventy thousand for waste and decay) twenty thousand pounds, leaving a very fine plantation on the ground.

The inclosed certificates will confirm my accounts, and if I should be deemed entitled to the Society's Gold Medal, I shall feel myself highly honoured and gratified, by having contributed to prove to what advantage this barren land might be turned, particularly as an adjoining common, on which there is much of this land, is intended to be inclosed.

I have the honour to be, Sir,

Your very obedient servant,

T. H. SCOTT.

Wimpson, Dec. 18, 1813.

To C. Taylor, M.D. Sec.

Certificates.

I John Poore, minister of South Stoneham, in the county of Hants, do hereby certify, that the land in this parish

parish called Thornhill, belonging to T. H. Scott, Esq. was in the year 1808, when he purchased it, but little more than embanked from the general waste, and but very few acres, about ten or fifteen, cultivated, and even those may be considered as worse than the others, as three or four crops had been raised without any kind of manure. Since it came into Mr. Scott's possession, it is brought into the highest possible state of cultivation, and affords the strongest proof of what may be done on very inferior land by good management. Last year the turnips exceeded any in the parish or neighbourhood, and the crops of corn were equal to any. In witness whereof, I have hereunto set my hand this 24th Day of April, 1813.

JOHN POORE.

South Stoneham Parsonage,
April 20, 1813.

I HEREBY certify, that I purchased the land called Thornhill, in the parish of South Stoneham, in the county of Southampton, for Thomas H. Scott, Esq. in July 1803, at which time the few acres of tillage land were not worth more than eight shillings per acre per annum, and that having seen at various periods the course of husbandry pursued by Mr. Scott, and the present state to which he has brought the said land, do value it at thirty shillings per acre, per annum, and will undertake to let the land to an undeniable tenant at that price, Mr. Scott to reserve to himself the house and plantations of fifty-four acres.

I further certify, that I superintended the plantations abovementioned, made in the spring of 1809, upon a gravelly soil, wholly unfit for tillage, and that there are fifty-

fifty-four acres; one half planted with larch, the rest being composed of Scotch-fir, and a proportion of birch, beech, and ash, and that there are about two hundred and seventy thousand young plants in a thriving condition.

The increased value of the land being from two shillings and six-pence per acre, to thirty shilling per acre, per annum.

JOHN Ross, Land Surveyor.

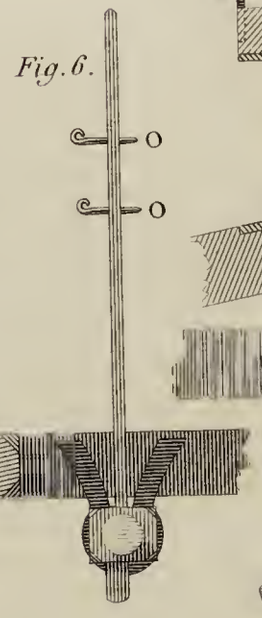
Wimpson, Dec. 18, 1813.

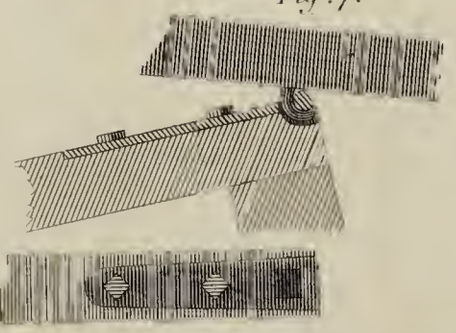
The SILVER MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* JAMES WILKINSON, *of Elsted, near Godalmin, Surrey, for his Invention of a new Turn-wrest Plough. The following Communications were received from him. An explanatory Engraving is annexed, and a Model of the Plough is preserved in the Society's Repository.*

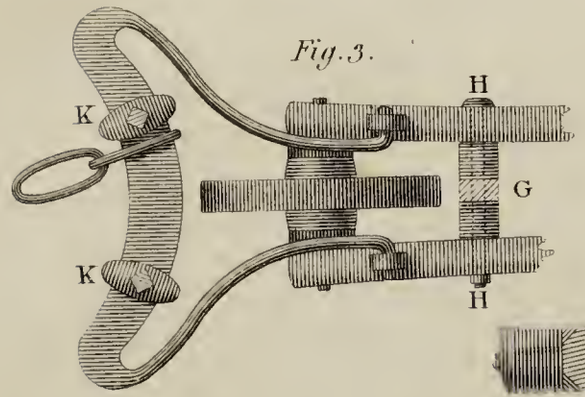
SIR,

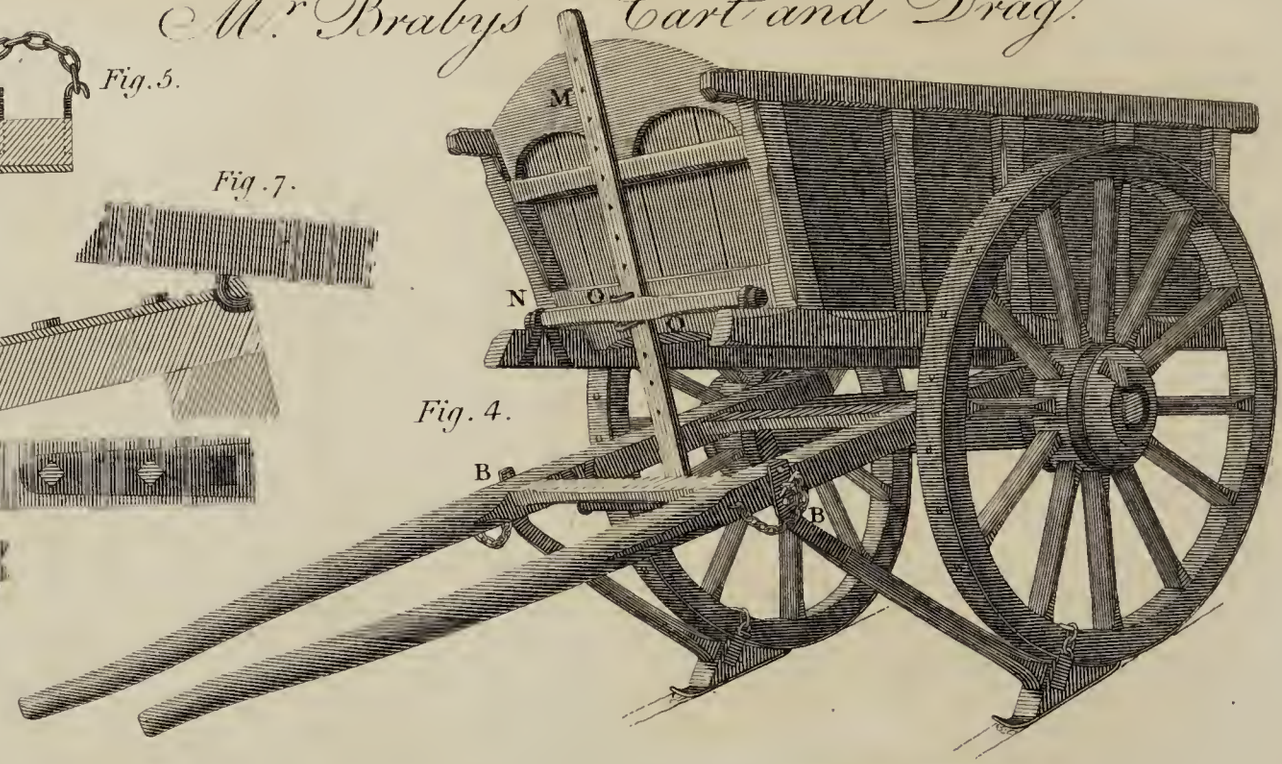
MY neighbour, Mr. James Wilkinson, a respectable farmer, has finished the model of his very curious and useful turn-wrest, or turn-rise plough, which he is desirous of laying before the Society of Arts, &c. I have one of the ploughs in my possession, which I have employed, and found perfectly useful. It has also been used by a neighbouring Magistrate, the Rev. Mr. Fielding, of Haslemere, whose land is very hilly, steep, and irregular; mine is flat and level ground. It has been shown to the most intelligent

Mr. Braby's Cart and Drag.









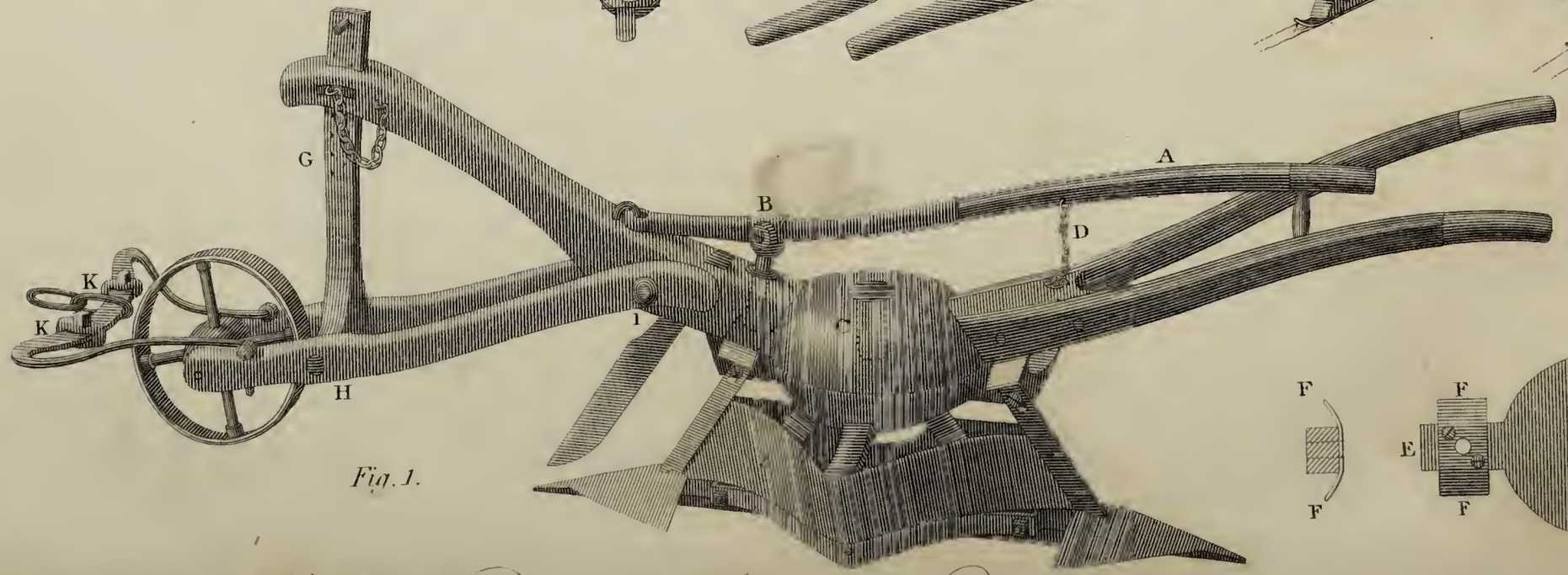
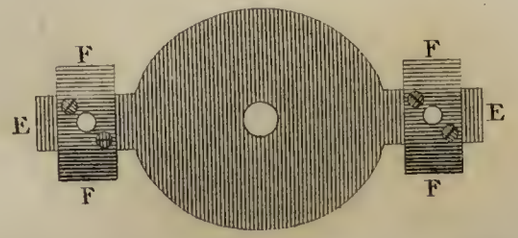


Fig.1.



C. Varley del.

Mr. J. Wilkinson's Turn-wrest Plough

G. Gladwin sculp.

gent agriculturists in this part of the world, also to the practical farmers in this neighbourhood, with great and uniform approbation.

Lord Middleton, J. Leach, Esq. and others, are so thoroughly satisfied of its superiority over any plough they have yet seen, that they have already ordered ploughs to be made for them according to the model. I speak of it from experience, having used it last year; and Mr. Fielding will also, from prior and longer experience, add his testimony of approbation. I beg leave to know when it will suit the Society for Mr. Wilkinson to attend with his model.

I remain,

Sir,

Your humble servant,

JOHN FOULKES.

Elsted, near Godalming, Surrey,
September 23, 1813.

To C. Taylor, M. D. Sec.

Sir,

I take the liberty of sending a model of the turn-wrest plough of my invention, and will send you certificates of its utility, as desired, as soon as possible.

I am, Sir,

Very respectfully,

Your obedient humble servant,

JAMES WILKINSON.

Elsted, Dec. 11, 1813.

To C. Taylor, M. D. Sec.

Sir,

Sir,

Mr. Foulkes having shewn me a letter stating, that another person had laid claim to the invention of my plough, I desired him to accompany me this morning to the Rev. Mr. Fielding, of Haslemere, for whom I made my turn-wrest plough near sixteen years ago, and from whom I have obtained the enclosed certificate, which, I trust, will prove me to be the original inventor; and I will procure other certificates respecting the performance of the plough in doing its work out of hand. This plough has advantages over all other turn-wrest ploughs that I am acquainted with, by doing the work better, and with more expedition. I have used it on my own farm for eight years, and it is now coming into general use in this neighbourhood. It will answer for all kinds of land, and may be used with two or more horses, according to the stiffness of the soil. It will plough hilly grounds, where other ploughs cannot act. The price of a plough on this construction is about six pounds ten shillings, or from ten to fifteen shillings more than a common plough; but this, from having two shares, will wear nearly twice as long as a common plough.

I am Sir, with great respect,

Your obliged humble servant,

James Wilkinson.

Elsted, Feb. 14, 1814.

To C. Taylor, M.D. Sec.

Certificate

CERTIFICATE of the Rev. James Fielding, of Denbigh House, Haslemere, Surry, one of the Magistrates for the County.

OCCUPYING my own land, and being fond of trying experiments in farming, I got a common turn-rise plough, made in the year 1798, which however did not do the work well; whereupon I immediately consulted Mr. James Wilkinson, a farmer, residing at Elsted, in this county, who made me the model of the plough he has presented in an improved state to the Society for the Encouragement of Arts, &c. He superintended and directed my own wheelwright (John Putlock) who I kept in constant employ on my own premises, in the entire construction of a plough, according to that model, which plough has performed its work to my entire satisfaction. My land is very hilly, stony, steep and irregular, and it has been used with equal success on level land, and it is my firm persuasion, that Mr. Wilkinson is the original inventor of it. As witness my hand this 14th day of February, 1814,

JAMES FIELDING.

DEAR SIR,

I HAVE the pleasure to inclose, on behalf of my neighbour Mr. James Wilkinson's plough, as respectable a Certificate as can come before any public body. It confirms all I have said of it, and too much cannot be said in praise of its ingenuity and utility.

For laying down land in grass, it is inimitable, and even for use as a common plough, it has, besides the qualities ascribed to it by the reverend Mr. Fielding and the present certificate, a peculiar advantage in one respect beyond the common plough, viz. that it comes equally right to the left-handed ploughman as to the right. I have no doubt, that if necessary, Mr. Wilkinson could obtain as many more signatures. I hope he will obtain the reward of his merits.

I remain,

Dear Sir,

Your's sincerely,

JOHN FOULKES.

Elsted, April 24, 1814.

To C. Taylor, M.D. Sec.

Certificates.

We who have hereunto subscribed our names, to which our respective descriptions and places of abode are added, do hereby certify that we have seen the turn-wrest plough, a model of which James Wilkinson, of Elsted, in the county of Surry, farmer, has presented to the Society for the Encouragement of Arts, Manufactures, and Commerce, at work, and that our several opinions of its properties and peculiar excellencies are, that it does the whole work of the common plough in every respect, as well as that plough, if not better.

That it is worked with more ease and expedition than the old turn-wrest plough, and does the work infinitely cleaner

cleaner and better than that plough; the share of which, from its peculiar form, is utterly incapable of it.

That it is extremely ingenious in its invention, simple in its construction, handy to its workman, and, beyond all comparison with any thing of the kind we have ever seen, perfect in its work.

And, finally, we think that, while neither the common plough nor the old turn-wrest can do the whole of the work of this plough, it is capable of doing that of each to the full as well as the one, and far better than the other. And yet, taking its construction, its facility of operation, and its probable durability (with two shares) into consideration, that it will scarcely exceed either of them in its price. As witness our hands this 6th day of April, 1814:

1 Midleton, Viscount Midleton, Pepper-harrow Park, Surry.
2 William Timson, Moor Park, Farnham, Surry, Esq.
3 John Thomson, Waverley Abbey, Surry, Esq.
4 John Leech, Lea, in the parish of Whitley, Surry, Esq.
5 Edward Leech, of the same place, Esq.
6 John Sitwell, Mansell, parish of Whitley, Esq.
7 S. Locke, D. D., Farnham, Minister of Elsted, and a County Magistrate.
8 Thomas Gooch, Milford, near Godalmin, Surry, Esq.
9 John Coleman, same place, farmer.
10 James Tickner, ditto, ditto.
11 John Roker, Shackleford, near Godalmin, farmer.
12 Richard Charrott, ditto, ditto.
13 Daniel Simmonds, Hartmore-place, near Godalmin, Surry.
14 Wm. May, jun. of Elsted, near Godalmin, Surry, farmer.
15 John Manwell, ditto, ditto.

16 Wm. Whittorn, of Elsted, near Godalmin, Surry, farmer,
17 John Jones, ditto, ditto.
18 John Storold ditto, ditto.
19 Stephen Cæsar, Pepperharrow, Surry, farmer.
20 Peter Wheeler, Elsted, Surry, farmer.
21 John Heath, ditto, ditto.
22 John Cæsar, ditto, ditto.
23 Henry Redford, ditto, ditto.
24 Wm. Grover, ditto, ditto.
25 Thos. Mansell, Tilford, near Farnham, Surry, farmer.
26 Samuel Mansell, ditto, ditto.
27 George Stovold, ditto, ditto.
28 John Whithall, ditto, ditto.
29 William Feast, ditto, ditto.
30 Nath. Attfield, Farnham, farmer.
31 John Howard, Elsted, iron master.
32 Francis Skurray, jun. Elsted, Esq.

Reference to the Engraving of Mr. WILKINSON'S *Turn-rise Plough. Plate* 1. *Figs.* 1, 2, 3.

FIGURE 1, is the plough, having a double ploughshare; by lifting the lever A, the bolt B is raised out of a hole in the share, and the whole of the plough, excepting the shares, can be turned on the axis C, and when half way round, the bolt locks itself in the opposite hole in the share; by which contrivance, one wheel, coulter and beam serves, and the change is complete and perfect, without any trouble. D is a chain to prevent the lever from being

being raised too high, by which contrivance, the bolt can never get out of place.

Figure 2, shows the bed on which the beam turns; EE, the opposite holes for the bolt: F F F F, the four inclined planes (shewn still plainer in the section), by which the bolt is raised, and locks itself: G, figure 1, is the upright staff for regulating the height of the wheel, having two rows of alternate holes, the pin goes through a loop-hole as wide as the rows of holes are apart, that it may go in the hole of either row; the upright staff has a pin at top, to keep it from coming quite out of the beam, and moves on an axis, H, below, and the wheel-shafts turn on an axis, I; KK, figure 1 and 3, are two sliding stops, with square-headed screws to fasten them in the required places, to regulate the draft of the plough sideways.

FIVE GUINEAS *were this Session voted to Mr.* JAMES BRABY, *of Vine-street, Pedlar's Acre, Lambeth, Surrey, for an improved Cart and Drag, from whom the following Communications were received. An explanatory Engraving is annexed, and Models of the Cart and Drags are preserved in the Society's Repository.*

SIR,

I BEG to leave herewith a model of my improved Sussex dung-cart, with props attached to it, to act as a drag, and prevent the shaft-horse from falling in going down steep declivities, as, by means of such props, the

weight is entirely taken off the horse's back, and one or both wheels locked so as to act as a sledge, and occasion the cart to descend a hill with an easy regular motion. The descent of hills is usually hard firm ground, and the fronts of the props being sloped upwards, they will readily slide over stones, or inequalities of the road. In every case, where a wheel requires to be locked, this prop may be used to a greater advantage, and it may be applied to one or both wheels, as judged necessary, and will be a great relief to the shaft-horse. This cart is also well calculated for laying dung upon land, as it may be retained in any angle required, so as to permit the manure to be laid in separate heaps on the field, without tearing up the grass sod of meadows, as is done when the common-tail prop is used.

I am, Sir,

Your humble servant,

JAMES BRABY, Wheelright.

Vine-street, Pedlar's Acre, Lambeth,
February 9, 1814.

To C. Taylor, M. D. Sec.

Reference to the Engraving of Mr. Braby's *improved Cart and Drag. See Plate* 1, *Figs.* 4, 5, 6, 7.

The drag has three holes at top, any one of which goes on a bolt in the shaft at *b*, and is secured by a pin; at the other end is a block suited to the curve of the wheel, and faced with iron, the point of which turns up like the iron of a skait; this is fastened to the wheel by a chain, and keeps its place by the hook rising on one side and the chain loop on the other; as shewn in section, fig.

fig. 5. The advantage of this drag, is, that the whole weight of the cart is taken from the horse, and rests on it; for the base which it adds to the wheel is about one-third its diameter. This is also the best prop, as it locks the cart and let the horse move ever so much, he cannot bring the weight on himself, and if left, he cannot run away. The cart is also poized exactly on the shaft over the axis, and the weight can be thrown forwards or backwards, or placed even on the axis at pleasure, (whether going up or down hill) by the adjusting bar *m*, in front of the cart, which slides through the middle of a cross bar *n*: and by the two pins *o o*, the cart is kept at the height required for poizing. Fig. 6, shews how the axis of the adjusting bar is fixed to the shafts. Fig. 7, is the hook which attaches the cart to the shafts, this hook so fits the hole, that it can never get off till the cart is down low enough for shooting the load, and should it then be liable to jolt off, a chain may be added from the middle front of the cart, to the middle of the axis which will be tight in that position, so that it can never get off without loosening the chain. The drag must be unpinned from the shaft, as well as unchained from the wheel to take it away, and may then be hung from the shaft to the axle-tree, or along the shaft to which it will chain, as to the wheel. Two drags may be used at once, as here shewn, if preferred.

The GOLD CERES MEDAL *was this Session voted to Mr.* LEONARD PHILLIPPS, *jun. Portsmouth Road, Vauxhall Turnpike, for the Culture and Application of the Mangel Wurzel Plant. The following Communications were received from him.*

SIR,

THE general prevalence of prejudice against all new improvements in agriculture, is so notorious, that the Society of Arts must not only be aware of it, but convinced of its injurious effects in retarding the advancement of this useful science.

It is to be lamented, that such a circumstance hath operated strongly in preventing the cultivation of that very useful vegetable, called by the Germans, Mangel Wurzel, a variety of which has been for some years produced in this country, of a much superior quality to the species introduced about thirty years ago by Dr. Lettsom, and which has occasioned the new variety to be but little known even in the vicinity of London, until I brought it into notice last season by growing about three acres of it on my land, near Vauxhall.

Hearing the extraordinary account of this valuable vegetable, I concluded it would be of great public benefit to introduce the culture of it in the neighbourhood of London. I accordingly procured some seed of Mr. Cochran, which he had obtained from the Marquis of Salisbury's plantation, at Hatfield, Herts, and which had been raised from seed, sold to the Marquis, some years before procured from Mr. Jenkins, then in partnership with Mr. Cochran,

Cochran, at a nursery in the New Road, near Paddington. This variety was originally obtained from Germany by a clergyman in this country.

I took great pains to obtain all the information in my power relative to the method of cultivating it, and I planted it in various ways to try which was the best, and used my best endeavours to bring it to the notice of agriculturists, cattle feeders, cow keepers, &c. that they might obtain a knowledge of this vegetable.

But after I had taken infinite pains to give publicity to this article, so powerful is the effect of prejudice, that it cost me much time and trouble to obtain purchasers for this root, and the result was, that I should have got more money from a crop of potatoes on the same land.

Notwithstanding the difficulties I have met with, and the pains and trouble I have taken, I should regard the honorary reward of the Society, as an ample compensation for my labours: and concerning the real value of the mangel wurzel, I beg leave to quote the opinion of that great and enlightened agriculturist, J. C. Curwen, Esq. of Workington, who in a letter published by him in the Farmer's Journal, in February last, asserts, that the two greatest discoveries in modern agriculture, in this country, are, the fiorin grass, and mangel wurzel.

I take the liberty of suggesting to the Society, that nothing will so completely conquer the prejudices I have noticed, as my plan of publicly exhibiting growing crops in the vicinity of the metropolis, to which scientific or intelligent men may resort for information relative to fruit or plants.

Permit me to add, that the Society's reward would stimulate me to indefatigable exertions in experimental agriculture, and cause me to bring to notice a great number

ber of crops, whose merit requires only to be more publicly known to be properly appreciated, and which knowledge must be attended with the greatest public benefit.

I am, Sir,

Your most obedient humble Servant,

LEONARD PHILLIPPS, Jun.

Portsmouth Road, beyond Vauxhall Turnpike,
April 7, 1813.

To C. Taylor, M.D. Sec.

SIR,

I beg leave to inform the Society, that I have lately attended Lord Somerville's cattle show, and that numerous cattle feeders, cow keepers, &c. to whom I introduced my mangel wurzel, have generally agreed in highly approving of it. Permit me to quote the following extract of a letter I received from William Waller, Esq.

Dear Sir,

"I have to thank you for an acquaintance with that invaluable root, mangel wurzel, and of which I have been the means of a great many acres being grown in this county, (Kent)—a friend of mine has perhaps one of the finest pieces ever seen."

Cattle feeders have given me the most decisive proofs of their approval of mangel wurzel. Some of them who tried it the last year, have called upon me this season, and have offered me considerably more per ton, than they gave me last year, and would purchase any number of tons that I could furnish them with. I think the most decisive and satisfactory evidence which I can give to the

Committee

Committee, is to lay before them some joints of meat, from a heifer fed solely on mangel wurzel, and which I have procured for that purpose. They are from a small Scotch heifer, which Mr. Barclay, of Bury Hill, near Dorking, had fed for a short time on mangel wurzel, and had sent to Lord Somerville's show, as an extra beast, to exhibit the wonderful fattening powers of this root, intending to send the beast back into the country to fit it for being slaughtered; but the butchers were so well pleased with its appearance, and it excited such general admiration and approbation, that Mr. Barclay was tempted to sell it; it was therefore killed on Wednesday, and cut up this morning. This meat has been viewed by judges, who have declared it excellent for so young and small a Scotch heifer.

The Society having offered a premium for preserving beets during the winter season and early spring months, I now send you the account of my method of preserving my crop of mangel wurzel, which is a species of beet, and the most useful variety of it, for feeding cattle. I took up the plants in November, 1812, and preserved many tons of it in every respect fit for the purpose of feeding various animals during the months of February, March, April, and May, 1813, some of the roots thus preserved, I sent to the Society, and I had a large quantity by me till the middle of last May, when I planted them out for seed.

I am, Sir,

Your most obedient humble servant,

LEONARD PHILLIPPS, jun.

Portsmouth Road, beyond Vauxhall Turnpike,
March 14, 1814.

To C. Taylor, D. M. Sec.

*** Mr.

*** Mr. Phillipps, in his attendance at the committee, stated that the mangel wurzel grows best in a deep sandy loam, that it does not exhaust the land, but clears it from weeds. That it may be sown either broad-cast or in drills, but the latter is preferable; that it should not be transplanted; that both the leaves and roots are valuable food for cattle; that the leaves are useful food for them in September and October, eaten green. That the leaves boiled for the table much resemble spinach, and the boiled roots have the flavour of the parsnip or sugary carrot. That some of his roots without tops weighed 16 to 18 pounds each. That he has known some plants with roots and tops to weigh from 20 to 30 pounds.

That Mr. Barclay's crop was 49 tons of roots to the acre; and the Marchioness of Salisbury's crop at Hatfield from 60 to 75 tons per acre.

That the ground for the growth of the mangel wurzel should be well pulverized. The proper season for sowing the seed is, from the middle of April to the end of May, as the weather best suits. That the seeds may be sown either by machine or hand; and he has found them to answer well when sown 18 inches apart each way, one capsule or seed pod in each hole.

That it will require about four quarts of seed to an acre; the spaces to be filled up when too thin, and the plants removed where too close.

That three or four crops of leaves for feeding cattle may be taken off by women and children in the following manner, viz.—They should place their hands on each side of the top of the root, at the footstalk of the leaves, leaving about six of the smallest central leaves between the forefinger and thumb of each hand; then spreading their hands flat, with the palms downwards, they should both be at the same time pressed down towards the ground;

and

and thus all the lower leaves separated or forced off by one motion. The leaves are then to be removed for use. It is best for the growth of the root to take off the leaves in wet weather.

The crop of roots should be taken up in November before the frosts set in, and the leaves having been previously taken off.

Method of preserving Mangel Wurzel Roots.

As the roots were taken out of the earth in November, they were removed in wheelbarrows to various convenient parts of the ground, and stacked thus:

The first layer of roots were placed upon the level ground, four feet in width, and extending in length, according to the quantity intended for each stack; the second layer was placed upon the first, but of a less width; and thus each layer was diminished until the stack was four feet high, when it had been contracted by the gradual diminution of the layers, to the width of one beet root, laid lengthways on the top of the ridge when finished. You are to observe, that the root end is to be placed at the outward side of each layer; and be particular that the roots are placed close to each other. The plants, before taken up out of the earth, had their leaves stripped carefully off, excepting two or three of the smaller inner leaves, commonly called the heart of the top.

The stack being thus formed, a trench or ditch was dug at a foot distance from the bottom of the stack, and the earth taken out and carefully banked up a foot thick over the whole stack, to keep the frost from the roots, and to preserve them perfectly dry by means of the ditch.

This method preserved the roots perfectly sound, and fit

fit for the purposes required during the months above-mentioned, in a very simple manner. This valuable vegetable was thus by little trouble preserved better than it would have been in any warehouse, and when a supply of roots was required, the earth at the part was removed, and replaced with little trouble.

The stacks were examined from time to time, and any earth which had slipped down in consequence of frost replaced.

Certificates.

Certificates of the culture of Mangel Wurzel.

This is to certify, that we know that Mr. Leonard Phillipps, Jun. grew last season at his plantation ground near Vauxhall-turnpike, about three acres of mangel wurzel, and that we are indebted to him for our knowledge of that vegetable:

William Waller, Perry-court near Feversham, Kent.
Francis Rose, Cattle-feeder, Battersea.
H. Heylyn, Lavender-hill, Battersea.
Thos. Vials, Wimbledon, Bailiff to Earl Spencer.

I do hereby certify, that I saw growing in 1812, at Mr. Leonard Phillipps's, Jun. exhibition of fruit trees near Vauxhall, about three acres of mangel wurzel, which appeared well cultivated, and to which crop I have once or twice alluded in the Farmer's Journal, calling the attention of agriculturists to it; and I am of opinion, that by growing and publicly exhibiting this crop in the vicinity of London, when it was little if at all known, he has introduced it to the notice and knowledge of many agriculturists,

ists, which is likely to promote its cultivation. That it was valuable food for milch cows and store cattle, was clearly ascertained in the few parts of the country where it was cultivated, Its fattening powers have been lately fully established, and I am of opinion from observation and certified facts, that nothing grown on a farm can exceed, and few things equal it in nutrition and profit.

J. GUTHRIE, Editor of the Agricultural part of the Farmers' Journal.

29, *Budge Row, March* 14, 1814.

Certificates of the Preservation of Mangel Wurzel.

WE do hereby certify, that we know that Mr. LEONARD PHILLIPPS, Jun. preserved many tons of the kind of beet root called mangel wurzel, the produce of about three acres, which he grew in 1812 at his establishment near Vauxhall, and which were preserved in stacks as he has stated.

They kept perfectly sound, and were in every respect fit for the purpose of feeding and fattening cattle during the months of February, March, April and May, 1813.

JAMES STONEHOUSE, Wandsworth Road,
RICHARD JACKSON, Wandsworth Road.
RICHARD CHANDLER.
ROBERT RAWLINGS.
SAM. BICKERTON.

The

The THANKS *of the Society were this Session voted to* J. C. CURWEN, *Esq. of Workington Hall in Cumberland, for Additional Information on Soiling, or the Feeding of Cattle in the House, and other Improvements connected with Agriculture. The following Communications were received from him.*

SIR,

THE Society instituted for the Encouragement of Arts, Manufactures and Commerce, having approved and sanctioned the system of soiling, I trust it may be satisfactory to them to receive a further proof of its utility than has hitherto been brought before the public. I am not acquainted with any experiments made to ascertain the practicability of rearing stock in the house. If such exist, they are without my knowledge.

I have to state to the Society, that my heifer was calved the 15th February, 1812, and was reared in the house.

For the first five weeks it had a gallon of new milk daily. From that time to the middle of May two gallons, and from thence to the 16th June one gallon, and hay tea. It had grass and clover to the middle of October, and from thence to Midsummer last was fed with turnips, mangel wurzel and wheat straw: during the remainder of the summer and autumn with refuse grass, and from October till the time it was killed in March last, it was fed with turnips and wheat straw. As my purpose was to breed from it, every means was taken to check its progress to fatten; finding this could not be done,

it

it was thought advisable to slaughter it, on 15th March last. The following is the statement of its weight;

When taken from food it weighed 72 stones of 14lb. each. After fasting 48 hours, it weighed 68 stone.

Blood weighed - -	2 stone	7 pounds.
Bag - - - -	9	3
Hide - - -	4	0
Feet - - -	1	2
Puddings - -	3	12
Head and heart - -	2	8
Tallow - -	6	6
Carcass - -	38	4
Total	68	0

Sale.

	£.	s.	d.
Carcass at 9s. per stone -	17	4	6
Tallow - - -	3	4	0
Hide - - -	1	7	0
Sundries - -	0	5	0
£.	22	0	6

Expense.

	£.	s.	d.
Value when dropped - -	2	2	0
Feeding - - -	12	18	6
Gain - - -	7	0	0
£.	22	0	6

The manure should more than compensate for the labour. If the object had been to feed it, a greater weight might have been obtained at little or no more expense. The colour of the meat was beautiful, and the grain and flavor could not be surpassed. As this is the first instance of beef being produced in so short a time, it has occasioned a good deal of speculation.

I shall send you a Certificate to vouch the statement. The heifer was of the short-horned breed, got by a bull of C. Mason's, of Chilton.

The success of this experiment has determined me to try it on a pretty extensive scale; if cattle can be stall fed from their birth, and slaughtered at two years old, the farmer and the public will both be benefitted.

I hope shortly to give you some account of my proceedings in burning clay, as a substitute for manure. It is practised with success to a great extent in Ireland. I have 400 acres of wheat this year, of new inclosed waste land, and the crop is looking well.

I remain, Dear Sir,

Your obedient humble servant,

J. C. CURWEN.

Workington Hall, March 18th, 1814.

To C. Taylor, M.D. Sec.

MY DEAR SIR,

From the inclosed Certificate, you will find my statement confirmed. I am very sanguine in the success of my experiment in rearing cattle. I have thirteen calves,

and

and expect two more that shall be reared on the soiling system. I shall keep them the first few months in a small inclosure of less than an acre, for the convenience of feeding them, rather than have them in different houses. I do not consider I gain any thing but convenience by it. You shall have the most accurate account I can procure. I hope to see you next winter, and that I shall then have got through with my great undertaking here in the coal trade, which will have cost me little less than seventy thousand pounds.

If I can bring my cattle to the butcher at two years old, they will pay me well. I am feeding at present my dairy on mangel wurzel. I am inclined to think it does not answer so well for milk as for fat. It is of an astringent quality, which operates against milking. The person who has superintended one of my dairies, made the same observation on the tops or leaves. It is however a most valuable root. I can keep it good to any time. The roots pulled before frost answered better than those which remained in the ground till March. I am dubious as to fiorin grass, not that it is not an admirable and valuable grass when it can be secured in the exclusive possession of the ground, but except on peat bog, where there is no existing seeds of vegetables, I do not know how this is to be done. The springing of other grasses destroy it. I have some acres that I fear will fail on this very account.

I shall send you shortly an account of my proceedings in burning clay for manure. I expect to have one hundred acres of wheat put in by it, and sixty bushels of lime. It is the sole mode of bringing the bog in o cultivation in Ireland. I cannot reconcile to myself, or fix on any principle, to which to attribute the superior fertility of the Irish soil. Six or eight crops running, without ma-

nure, and after all the land is in a state for bearing grass. Their rents far exceed ours. Six pounds the English acre very common, paying tythes.

I have sold my larch bark for ten pounds per ton, and it is much approved. This will give a decided preference to larch over every other species of wood.

I find larch to answer for the handles of picks, but they will not bear great strain. We have found it best to saw them from the blocks.

I remain, Dear Sir,

Your obedient humble servant,

J. C. CURWEN.

Workington Hall, May 8th, 1814.

To C. Taylor, M. D. Sec.

Certificate.

I hereby certify, that the two years old heifer, slaughtered at the Schoose farm on the 15th of March, 1814, was calved the 15th of February, 1812. The live weight was 72 stone, of fourteen pounds each, the carcass 38 stone, the loose fat or tallow six stones and six pounds. The mother is believed to have been a cross of the Airshire breed, the sire, a short-horned bull of C. Mason's, Esq. The food given her from the 15th of February, to the 22nd of March, was one gallon of new milk per day. From that time to the 14th of May, two gallons; from thence to June 16th, one gallon with hay tea; afterwards with clover and other grasses, to October 12th. From that time, to the June following, she was fed with turnips, mangel wurzel, and wheat straw. During the second summer,

summer, with refuse grass. The propensity she had to fatten, caused the worst food to be given to her, as the object was to breed from her. From October till she was killed, she had turnips and wheat straw. Notwithstanding this poor diet, she continued to fatten so unaccountably, that there was not much chance of her doing well as a breeder; it was therefore decided that she should be slaughtered. If it had been the object to prepare her for the butcher, with little or no increase of expense, she might have been made much fatter. The colour of the carcass was admirable, and the beef well flavoured.

This heifer never was out of the house. From this instance, as well as others which I have seen at the Schoose farm, there are strong grounds for believing, that cattle may be reared on the soiling system with great advantage, and brought to a much earlier maturity, and with less injury and cost, than by turning them to pasture.

William Glover.
Thomas Thompson, Bailiff.

The Silver Ceres Medal *was this Session voted to* Miss Ann Clague, *of Chester, for her Method of producing new Potatoes throughout the Winter Months. The following Communications were received from her.*

SIR,

At the end of July last, I waited upon you at the Adelphi, with a lady, Miss Clague, of this city, who wished to shew you a specimen of some potatoes she had raised by a peculiar method, so as to be fit for use at Christmas and January every year. She raised four crops from the one old potatoe which she left with you, and set in your cellar for a fifth crop. She has now the pleasure of sending you six pounds of her new potatoes by the coach, so as to arrive on New Year's Day, and she wishes your opinion as to the utility of the discovery of her method of raising them in winter, or any month in the year; and whether it is likely to merit the attention of the Society, so as to entitle her to any small mark of their favor, on her giving all the particulars of her method of raising them. Dr. Thackeray, of this city, will, if needful, certify to the particulars, for the satisfaction of the Society. The favor of your answer will oblige,

Sir,

Your very obedient servant,

JOHN CHAMBERLAINE.

Chester, Jan. 12, 1814.

To C. Taylor, M. D. Sec.

SIR,

SIR,

As you request me to send the particulars of my method of raising potatoes all the winter, I now beg leave to inform the Society, that after a variety of experiments, I have found the following to be the best.

I prepare a proper quantity of red sand, rather of a loamy nature, and mix up with it a proportion of lime in powder, viz. about one-third or one-half, about fourteen days before I use it.

This soil is to be spread about three inches thick, at the bottom of any old wooden box, or even on a very dry brick cellar floor. The cellar ought not to be exposed to the frost, nor yet too much confined from the air. I then procure a measure or two of large potatoes of a prior years growth; the sorts I prefer are the red apple potatoe, the pink eyes, or Mr. Curwen's purple potatoes. I set these on the soil whole about three inches apart, with the crown or principal eye to the soil in preference, but I put no soil over them. The potatoes which I sent you were produced from potatoes thus placed about the 20th of September, which allows from ten to twelve weeks for their growth; they grew at the bottom of the old potatoes, and were attached to them.

The old potatoes also threw out numerous sprouts or stalks, with many potatoes growing on them, but these sprouts were killed by the very intense frost of the present winter, and as I found them to damage both the new potatoes and the old sets, I removed them. I have no doubt but that these sprouts would have produced a crop of potatoes if the frost had not damaged them.

The original potatoes for planting whole for sets in September, should be such as were of perfect growth in

the October of the preceding year, and well preserved during the winter; the sprouts which are shooting from them should be removed by the end of April, and these sprouts which will be from 6 to 20 inches long, may be planted with all their fibres in a garden, for a first crop. About June 15th, the potatoe sets must be sprit again, and the sprouts planted for a second crop; and in September, the potatoe sets must be sprit a third time, and the sprouts of this last produce thrown away as useless. At the end of September, the original or seed potatoe is to be gently placed on the soil as before mentioned, for a Christmas crop. At the end of three months at furthest, the old potatoes should be carefully twisted from the new ones, and the sprouts taken off the old potatoe; and the old potatoe is then to be placed on its bottom or side, on a fresh bed of soil prepared as before, and left to produce another crop from fresh eyes placed next the soil, as you are to observe, that the old potatoe should not be set or placed twice on the same side, and you must take care, at that time to remove the sprouts, to prevent this moisture rotting the old potatoe.

By the above method of planting and turning the old potatoes, I have had four crops of new potatoes from one potatoe, exclusive of those crops produced from the sprouts planted out in the garden in April and June.

The produce from one bushel of about eighty pounds weight, has been already about thirty pounds of new potatoes of good quality, but the bushel must have lost considerably in weight from the sprouts and stalks thrown out and removed at different times.

If any of the old potatoes should prove to be in a decaying state, they should be removed immediately, as worms

and

and a black fly would be otherwise apt to damage the whole.

I must beg leave to observe, that from the sprouts taken from the seed potatoes in April and June last, and planted in a common garden; I obtained two crops of good well grown potatoes, in September and October last, weighing from eight to twelve ounces each potatoe; the crops were very plentiful in proportion to the quantity planted.

On examining the potatoe bed in my cellar, about three weeks past, I found the frost had penetrated there, and the thermometer as low as 30 degrees; but in general it has been from 35 to 40 degrees, in the last two or three months.

The greatest weight of any of my new potatoes, has been two ounces and a half, but they run, in general, from half an ounce upwards.

The sprouts, which were injured by the frost at Christmas, and thrown away, were produced from ten pounds of potatoes; they had hundreds of small potatoes attached to them, but nearly all spoiled by the frost.

My seed potatoes have been tried on two sorts of soil; one in the proportion of one-fourth lime, and three-fourths loamy sand, and the other from equal parts of each. From the first, more sprouts were thrown out, but the potatoes were not so firm and dry as from the latter.

I remain, with respect,
Sir,
Your most obedient servant,
ANN CLAGUE.

Chester, February 1st, 1814.

To C. Taylor, M. D, Sec.

Certificate

Certificate from W. W. THACKERAY, M. D.

SIR,

MR. CHAMBERLAIN has shewed me your letter to him of the 15th ult. wherein you request me to certify the particulars, as to the growth and cultivation of potatoes, for a Christmas or winter crop. I now inform you, that I have read the annexed account, and new method of raising potatoes during the winter season, by Miss Clague, and have seen the cellar in which they have been raised during two winters. I have also eaten some of the produce of this and the preceding year, which proved very good. Having examined and seen them in a growing state, I hereby certify, that the annexed particulars contain an accurate account thereof.

I am, Sir,
Your humble servant,
W. W. THACKERAY.

Chester, February 6th, 1814.

To C. TAYLOR, M. D. SEC.

*** The Committee are aware that new potatoes are frequently collected from amongst the sprouts of old potatoes laid in heaps in cellars during the winter: but their taste is usually earthy and unpleasant. They know also of various other modes of raising them early, but they believe none will be found more cheap, and easy in management, than Miss Clague's method; the potatoes being remarkably well favoured, and may be kept longer without prejudice after gathering, before dressed, than new potatoes grown in the natural ground.

PAPERS

IN

POLITE ARTS.

Twenty GUINEAS, *were this Session voted to Mr.* PETER NICHOLSON, *No.* 10, *Oxford Street, for an Instrument called a Centro-lineal, useful for drawing in Perspective; the following communication was received from him, an explanatory Engraving is annexed, and the Instrument is preserved in the Society's Repository.*

SIR,

I BEG leave to send, for the consideration of the Society for Encouragement of Arts, &c. an instrument of my invention, called a Centro-lineal, for drawing lines to inaccessible vanishing points in perspective, an operation in general very troublesome to perform, especially where the distance of such points from the drawing exceeds the distance of the walls of the apartment, and even in offices, where the distance is only ten or twelve feet, it will be found in its application more easy to handle, to require less

attention,

attention, and to perform with greater facility than a heavy rule of the same length, which takes up the whole of the room, thus only admitting one person to draw at a time. Having experienced its efficacy in my own line of business, (that of teaching Architecture and Perspective) for more than twelve months past, I can speak with confidence of its performance.

The idea of the invention occurred to me more than twenty years ago, when I had a model made sufficient to explain its properties, though not sufficiently accurate for use. If the Society should think it deserving their approbation, any reward they may think fit to bestow will be gratefully received, by,

Sir,

Your most obedient Servant,

PETER NICHOLSON.

No. 10, *Oxford Street*,
April 13, 1814.

To C. Taylor, M. D. Sec.

Description of the Centro-lineal. See Plate 2, Fig. 1, 2, 3.

In fig. 1, let A B and C D be two bars so regulated by the following contrivance, that the straight edge C D of the bar C D in motion may always cut a straight line A B, passing through the middle of the bar A B at rest. For this purpose let E and F be two points in the line A B, and let E I and F K be two other bars, so that the lines F K and E I passing longitudinally through their middle may be parallel: H G is another bar of which a

line

line H G passing through the middle is parallel to the line E F passing through the middle of the bar A B; then E F G H will be a parallelogram: Now let the points I and K be in the line C D; then suppose E to be a fixed point in the bars A B and E I; F a fixed point in the bars A B and F K; G a fixed point in the bars F K and G H; H a fixed point in the bars E I and G H; I a fixed point in the bars E I and C D; and K a fixed point in the bar F K, but not in the bar C D; suppose the bar A B fixed, and the other parts put in motion according to this construction, the points I and K will describe similar arcs, and the bar C D will always cut the line through the middle of A B at the same distance from either of the points E or F.

In order to effect this motion, P Q is a groove parallel to the right edge C D; N O is a slider: K is a point common to the slider N O and to the bar F K, so that when the instrument is in motion the point K will always be in the edge C D.

The bar F K is so contrived that it may be lengthened or shortened to certain limits, so as to make the vanishing point on the one side or the other as may be required, in the following manner:

The bar F K is made double. The lower part F G is fixed to A B and G H, and the upper part L K has a longitudinal slit to slide upon a pin G passing through the bars G H and F G. In the line F K at M is another pin, in order to keep the middle of the slit in the straight line F K and to fix or unfix the two parts of L K and F G at pleasure.

To shew the truth of what has been asserted, let A B and C D, fig. 2, be the two bars of which A B is fixed; then if C D be moved according to the preceding regulation,

tion, the line C D will always pass through the same points in the line A B produced.

For though I draw I R parallel to A B, so that E F R I will be a parallelogram: then because of the similar triangles K R I and I E S, K R, : R I : : I E : E S; but since I R, R I, I E, are given lengths, the fourth proportioned E S will therefore be invariable, whatever the angles of the instrument makes in its revolution.

To set the instrument so as to tend to the same point in which if two straight lines A B and T U, fig. 3, would meet if produced lay the edge of the instrument A B upon the straight line A B, then suppose the parts of the diagram as expressed by the similar letters to those in fig. 1, to be the elements of the instrument, the middle of the bar A B be laid upon A B; move the other parts so that the point I may meet the line T U in V, unscrew the nut of the lengthening and contracting bar F K, and revolve the line C D round I, which is fixed so that I D may fall upon V U, then screw the nut tight, and the instrument will be set as required.

Note—There must always be an index or line on the fixed bar A B so as to set it to a given point in the vanishing or other line, and that the instrument may be removed when necessary, and set to its place again with the same accuracy as before.

The

Mr. P. Nicholson's Centro-lineal.

Fig. 1.

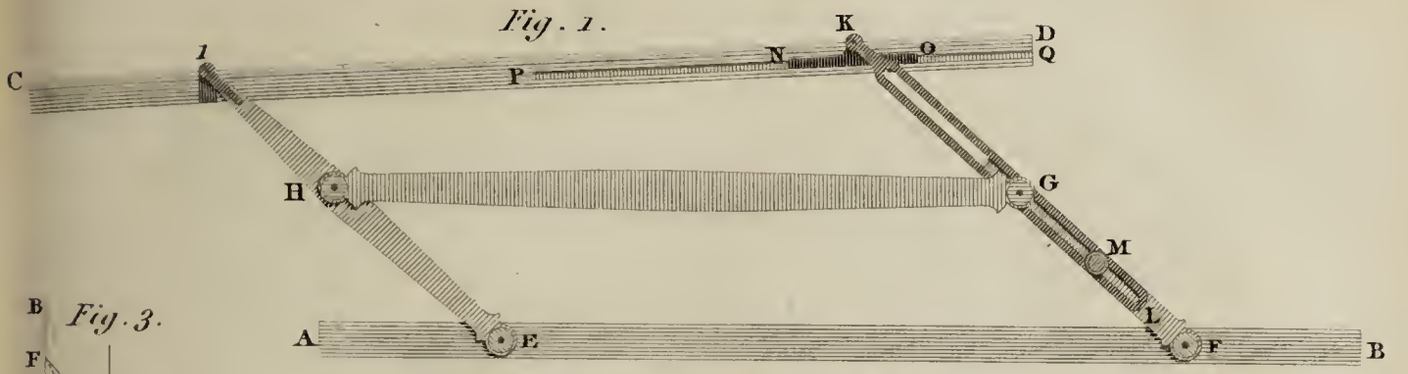


Fig. 3.

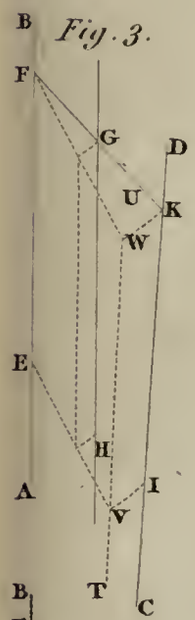
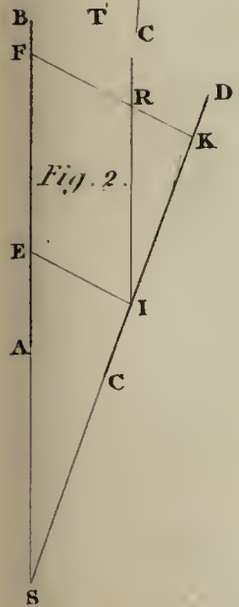
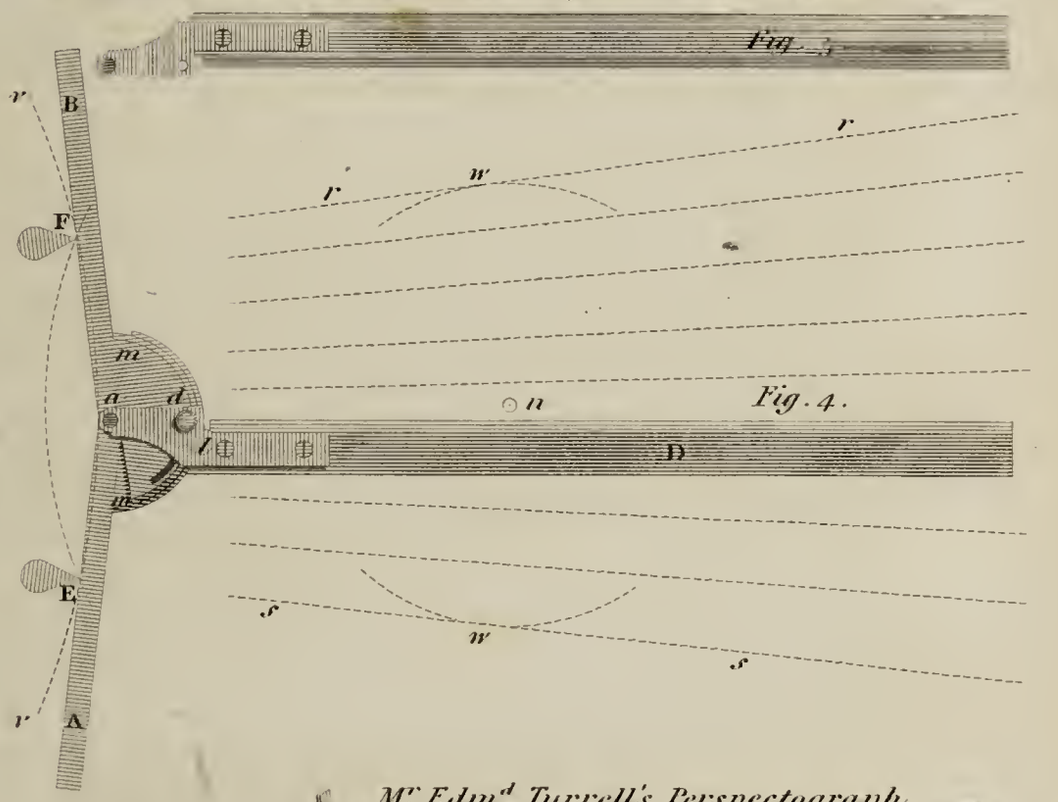


Fig. 2.



Mr. J. Farey's Instrument for drawing lines to an inaccessible centre.



Mr. Edm.d Turrell's Perspectograph.

Fig. 6.

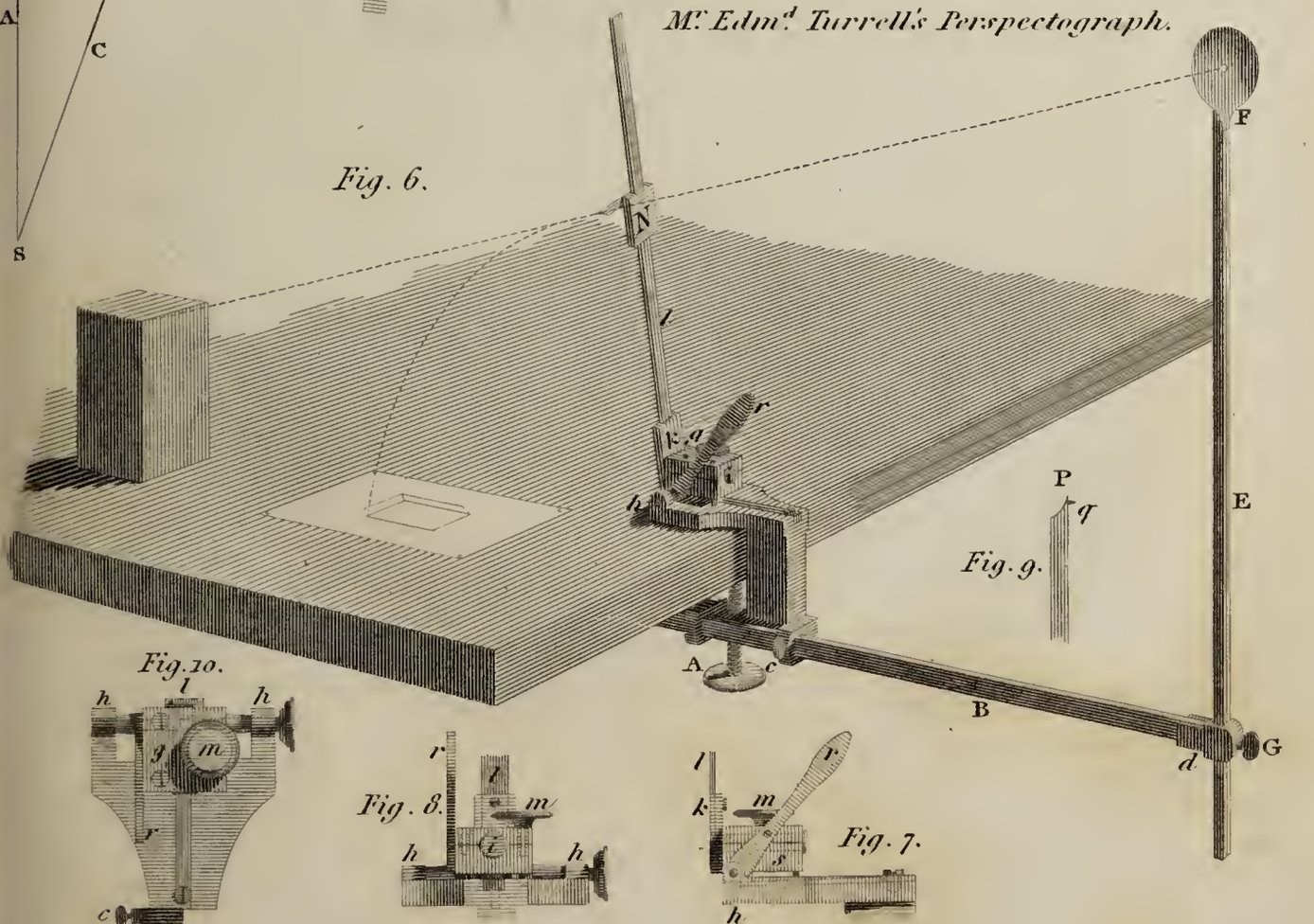


Fig. 10.

Fig. 8.

Fig. 7.

M.A. Nicholson delin.

E. Turrell sculp.

The SILVER MEDAL *was this Session voted to Mr.* J. FAREY, *Jun. Crown Street, Westminster, for an Instrument useful in Perspective drawings. The following Communication was received from him, an explanantory Engraving is annexed, and the Instrument is preserved in the Society's Repository.*

SIR,

WITH this you will receive an instrument of my invention for drawing lines converging to a distant point. This I have found extremely useful in making perspective drawings, as it gives an artist the means of making a drawing upon a board or table of moderate dimensions though the vanishing points fall at ever so great a distance; for the instrument is quite general in its properties, being capable of drawing parallel lines, which may therefore be considered as converging to a point at an infinite distance, or it may in a moment be altered to draw to a point within a few inches distance. I shall be obliged to you to communicate this to the Society.

The first instrument of this kind, I made in the year 1807, and I have had it in constant use ever since, as it applies with advantage to almost every perspective drawing; I have been induced to present it to the Society, at the request of several members to whom I have shewn it, but in so doing I do not wish in any degree to deduct from the credit due to Mr. Peter Nicholson, for his ingenious instrument, called the centro-linead, and intended for the same purpose. As an invention, mine is by no means to be compared with his, which is founded on a geometrical principal that I believe is new, and has been carried into

execution

execution in a very complete manner: mine is merely an application of a well known principle to the purpose I wanted; but having in several years use found it a very valuable acquisition, I wish to make it known to other artists through the medium of the Society; the simplicity and cheapness of this instrument will, in some cases, give it a preference to the centro-linead, particularly where a picture requires to have two or three of the instruments in use at once, for as many differing vanishing points which fall beyond the limits of the drawing-board. I have very frequently used two at once, without any inconvenience, because it has no attachment to the drawing board, and may therefore be removed in an instant to apply any other rules, &c. which the drawing requires.

It may be used indifferently to draw to a point, either on the right or left side. To set against these advantages, it is not so readily adjusted to the direction required, as Mr. Nicholson's, but when once done, is not liable to be deranged.

I remain, Dear Sir,
Yours truly,
J. FAREY, Jun.

12, *Crown Street, Westminster,*
April 18th, 1814.

To C. Taylor, M. D. Sec.

Reference to the Engraving of Mr. Farey's *Instrument for drawing Lines to an inaccessible center. Plate 2, fig. 4, 5.*

This instrument acts upon the drawing board, or table, on which the paper is fastened, with as much facility and as little attention as a T square does, when drawing parallel lines, and will be found extremely useful to those who

who draw buildings, &c. in perspective, as the points to which the lines for such drawings should converge, will often fall at a distance of 12 and 15 feet from the picture, so as to render it impracticable to employ rulers of sufficient length to reach the points, and there is, except this instrument and Mr. Nicholson's lately invented, no other practicable method of drawing such lines.

The instrument consists of three rulers, A B and D, fig. 4, which are united by a common centre-screw *a*, and have a thumb screw *d*, which fixes them fast at any angle at which they may be placed; EF are two fixed weights, or rests, against the edges of which the rulers A B are applied, when the instrument is used; or pins fixed into the table will answer the same end very conveniently. By sliding the instrument against these stationary points, as shewn in the figures, the ruler D will draw converging lines, as shewn by the dotted lines, which all converge to a common center, the distance of which will depend upon the angle of the ruler A B, and the situation of the points EF; the edge of the ruler D, must in all cases be made to bisect, the angle formed between the other two, otherwise the lines which it draws, will not converge to a common center, but will form tangent to a circle, of small radius, described round the intended center point; this indeed is a case which geometricians may sometimes find useful, but for artists, who require the lines to converge to one point, the thin edge of D must bisect the angle formed between A and B. The manner of setting the instrument for any particular case, is thus:—Suppose we have given the two extreme lines *r w r* and *s w s* (dotted) which converge to the intended point; suppose it is required to draw a number of others to the same point, the pins

or weights E F, must be set upon these lines, but at equal distances from the center or point where the lines could intersect to find the situation proper for these points, place the leg of a pair of compasses upon some point situated between the two lines, *r s*, and find experimentally by repeated trials, that when a circle (as shewn at *w w*) is described by the other point of the compasses, the two lines *r s*, will form tangents to it, from this point, which suppose at *n*, with a sufficient opening of the compasses, mark off two points as at E F, by striking an arch E F across the lines, and these will be equidistant from the center. The pins being placed in these points, apply the instrument to them, with the clamp screw *d* loose, then slide the rulers A B against the pins, till the ruler D comes to one of the lines, as *r*, and here incline the rulers on their center points, till the edge of D corresponds with it, when A is in contact with the pins, now remove it till the ruler D matches with *r*, and there make a similar adjustment, that B will touch the pins. The clamp screw being now fastened, fix the rulers as they are adjusted; and then on sliding the two rulers A and B against the pins E F, the edge of the third ruler D, will in all positions tend to the same center point as the lines *r r* and *s s*; the angle or point *a*, in which the rulers A B meet, will, in the motion of the instrument describe a segment of a circle, as shewn by the dotted line *v* E *a* F *v*, and the center to which the lines tend is a point in the opposite circumference of that circle. This point will be found by bisecting the distance E F upon the dotted arch, and from this point, drawing a line through the center of the circle *v* E *a* F *v* till it cuts the opposite circumference, and to this point the lines will converge.

If

If the instrument is required to have a greater range, or to draw more convergent lines than between F *r* and E *s*, other pins must be fixed for its rulers to act against; taking care, that they are placed at the same distance from E or F as these are from each other. Their proper situation will be determined, by the rulers A B themselves; thus, by sliding the rulers against the pins, till the angle between them comes to one of the points E or F, the new point must be placed so as to be in contact with the edge of that ruler which overhangs the pins, and at the same distance from the present pins E or F, as it is between them.

The construction of the instrument is apparent, from inspection of the figure, the two rulers A B, have circular parts *m* behind the center, which apply one upon the other, and a projecting part *l* from the ruler D lies over both; the center screw *a* passing through all three; an arched grove is cut through both the circular parts *m m*, to admit the screw *d*, which also passes through *l*, and thus fastens them all three together, by screwing into a nut, fitted into the arched groove, of the lower one; the ruler D is made of wood or ivory, as shewn separate in fig. 5, and screwed to the underside of *l*, so that it comes into the same plane with A and B. The instrument will draw parallel lines like a T square, when A B are set in a straight line, and if the circular part *m* is graduated, it will make a protractor, to set out angles; fig. 5, is an extra-ruler, to be applied in lieu of D, when the instrument is required to draw lines to a center, on the opposite side; it is merely reversed to the other, having the hole in *l*, which is for the center screw *a* in the line

of the opposite edge, to that which is shewn in use in fig. 4, one being intended to draw lines tending towards the left hand side, and the other towards the right hand side.

The SILVER MEDAL *was this Session voted to Mr.* EDMUND TURRELL, *of Gee Street, Clarendon Square, Somers Town, for his Invention of a Perspectograph, or Instrument for Drawing Objects in Perspective. The following Communication was received from him, an explanatory Engraving is annexed, and the Instrument preserved in the Society's Repository.*

GENTLEMEN,

IN examining the various contrivances that have been invented for the purpose of making perspective drawings by mechanical apparatus, scarcely any that I know of have been brought into general use, although most persons in the habit of making such drawings have expressed a wish that some contrivance might be found possessing simplicity in its form, moderate in its expense, and so small in bulk, that an artist might conveniently carry it to the objects of delineation.

One of the most simple, and perhaps the best contrivance that I know of, is described in a work on perspective by Ferguson; this is composed of a brass frame fixed upon hinges,

hinges, which enables the artist to lift it up and lay it down when the perspective point is obtained. The mode of getting the point is by the intersection of two wires, or fine threads, which may be made to cross each other within any part of the frame, but as these must frequently have to cross each other at very acute angles, the precise point must be very difficult to obtain. Besides this objection, the instrument, from the nature of its construction, must of necessity be fixed to a board, which, added to the frame, would render this no very portable object. These were the considerations which gave rise to the one which I have the honour to present, and I trust that when the great number of persons are considered who can draw plans and elevations with neatness aud accuracy, but who have no knowledge of the rules of perspective, nor inclination to pass through a series of mathematical problems to attain a proficiency therein, sufficient to enable them to draw even a simple piece of machinery perfect, it renders the invention of such an instrument exceedingly desirable, at a time too like the present, when the knowledge of science is so widely diffued, and is still susceptible of considerable improvement, if accuracy of depicted representation keeps pace with correctly written information.

The principal objection to all instruments that find the perspective points, or extremes of lines, is the length of time that is necessary for conducting the operation. But let an artist who has all the advantages arising from practical habits of drawing, sit down to delineate a machine (or any object that may be chosen,) and let a person in the habit of using such an instrument as the present, begin with the same subject at the same time, and tedious as the operation of finding points may appear, I should have no

fear but the result would prove in favour of the instrument; at the same time, the superior accuracy produced by it, would appear evident.

I believe it will not be denied, that there are many respectable artists, who have a knowledge of perspective sufficient to answer most cases in architectural and picturesque delineation, that would greatly object to draw a complex piece of machinery in perspective, there being such a degree of accuracy required in this branch of art, and so many rules to put in practice to obtain perhaps only a few lines or points, that it requires the aid of some mechanical invention to abridge the labour and ensure the accuracy of the operation.

It is not in Machinery alone that such a rigid degree of accuracy is requisite; scientific subjects in general require it to be continually exercised. By way of example, I have two models of crystals, and perspective drawings of them done with the instrument, such as appear to me most difficult to represent by the common rules of perspective. These subjects are frequently occurring in the science of mineralogy, and present to an artist one of the most difficult tasks in the practice of perspective; but by the application of the instrument, they are rendered comparatively easy, even to those unaccustomed to perspective delineation. I shall now proceed to describe the construction of the instrument, and the manner of using it.

The principal part of this instrument consists of a steel rod having a small slider, which is capable of moving up and down upon it freely, but remains stationary by the pressure of two small springs acting on the rod. This slider carries a projecting piece of steel, having a small point bent at right angles at its extremity. One end of

the

the rod is screwed fast to an axis, which turns in a brass joint, which has an adjustment for tightening it, so that the rod may be kept in any position.

The brass joint moves on an axis perpendicular to the one attached to the steel rod: this axis serves to unite the apparatus to a clamp, which may be fixed to any table or board by a thumbscrew. To the side of the clamp, two small loops are fixed, through which a steel bar slides carrying the eye piece, which may he fixed at any distance, and retained by a tightening screw in the loop; the eye piece may also be elevated or depressed at pleasure, and kept at any height that may be desired by a small thumbscrew.

When the instrument is to be used, the clamp must be screwed tight to a board or table, and the paper upon which the drawing is to be made, must be laid down close to the clamp, and fixed firmly with a few bits of soft wax. The pin or axis upon which the brass joint turns is then to be pressed firmly through the holes in the clamp, and the steel rod which has the slider upon it will stand perpendicular to the table by the pressure of the spring under it, similar to the joint of a clasp knife. This rod may now be moved from the right hand to the left, generating by its motion an imaginary semicircular plane, which is to be considered as the plane of the picture; by the union of this motion, and that of the slider upon the bar, the steel point may be brought to any given position in the plane of the picture.

The theory upon which this instrument is formed being understood, the practice will consist in placing the object to be drawn at a convenient distance from the supposed plane of the picture, and having fixed upon the height at

which the eye of the spectator shall view the object, next determine the distance the picture shall be from the eye, (or, as it is frequently called, the point of sight). This being done, the eye of the artist must be applied to the hole in the eye-piece, and the steel point be brought to coincide with the extreme point of any line in the object to be drawn. Having performed this part of the operation with great exactness, the rod may be turned down by moving the brass piece upon its axis (using for this purpose the small handle) until the steel point comes in contact with the paper, when the fore-finger must be pressed upon it till the bent point enters it sufficiently to make a visible puncture, which is the perspective representation of one extreme point of the given line. The same operation is to be repeated to obtain the other, and the two points being joined by a line, it will be the perspective representation of the original line in the object to be drawn.

When curved lines are the objects of delineation, any number of points may be obtained in them by the instrument, which being transmitted to the paper, and carefully drawn through with a steady hand and a fine pencil, the perspective representation of curved objects may be obtained with great ease.

I trust it will be unnecessary for me to say any thing further, as the great number of experienced artists and men of science who constitute the body of your Honorable Society, leave no doubt in my mind, that if any merit should be found in this invention, it will be duly appreciated.

I am, Gentlemen,

Your most obedient, Humble Servant,

E. TURRELL.

No. 4, Gee St., Clarendon Sq. Somers Town.

To the Society for the Encouragement of Arts, &c.

Reference to the Drawing of Mr. Edward Turrell's Perspectograph. Plate 2, Figs. 6, 7, 8. 9, & 10.

The foundation of this Instrument is a brass clamp, see Plate 2, fig. 6, having a screw at A to fix it to a table, drawing-board, &c.; to the lower part of this clamp two loops are attached, in which the bar B slides, and may be kept at any distance within its range by the binding screw *c*; the bar B has a loop fixed on one end, as shewn at *d*, to receive a rod E, at the end of which is placed the sight-piece F; this rod may be retained at any height by the screw G.

To the upper part of the clamp two ears are attached, one of which is seen at *h*; between these the block *g* moves on an axis or taper pin, the end of which is seen coming through the ear at *h*; the block *g* has an axis passing through it a little above, and exactly at a right angle to the taper pin before mentioned; the one end is seen at *i*, fig. 8, and from the other projects the piece *k* to receive the bar *l*, this bar may be turned from the right-hand to the left, and vice versa, retaining its position at any angle by the friction on the axis, which may be increased at pleasure, as the block which receives it is divided in two, the upper part being pressed upon the axis by a tightening screw, shewn at *m*, fig. 8, which represents an end elevation of the upper part of the clamp.

The slider N, moves freely up or down, the bar *l* retaining itself in any situation by the pressure of two small springs enclosed within it, pressing against the bar.

The bar *l*, which is attached to the block by its axis, is kept in a perpendicular position by a spring pressing under the block, exactly in the same manner as the spring

of

of a clasp-knife presses upon the square tongue or shoulder of the blade. The position and action of this is best seen by dotted lines at *o*, in the side elevation of part of the clamp at fig. 7; *s*, in the same figure, shews the under half of the divided brass block.

The slider N, has a projecting piece formed into a point as shewn at fig. 9, the end P being used to make a coincidence with any part of the object to be drawn, and the point *q*, which stands at right angles to it, is for the purpose of marking the perspective representation of that point upon the drawing, when the bar and slider are laid down upon the paper, and the point pressed upon by the finger, so as to make a small puncture.

The handle *r*, is for the purpose of elevating or depressing the bar and slider when they have been brought to any position desired, and prevent the accidental shifting of the bar, which might occur if the hand of the operator was to touch it in laying it down,

Fig. 10, is a plan of the clamp, the letters the same as referred to in the other figures.

When the instrument is to be prepared for use, the brass block or joint *g* is to be fixed in the ears of the clamp by the axis or pin *h*, upon which it turns. This part of the apparatus is then ready to be screwed to a table, drawing-board, &c. by the thumbscrew A. The paper upon which the drawing is to be made, may be fastened to the drawing-board on one side, by passing it under the clamp before it is screwed to the board or table, and the other sides may be confined by a few wafers, sealing-wax, &c.

The bar *l*, by the pressure of the spring under the brass block or joint, will stand perpendicular to the drawing

ing-board, and may be turned either to the right or left, generating by such motion an imaginary plane, which we have before observed, is to be considered as the plane of the picture.

The slider N, may be moved up or down upon the bar *e*, when it will be seen, that by the union of the two motions, namely of the bar upon its axis *i*, and of the slider N upon the bar *l*, the small point fixed to the slider may be placed any where in the supposed plane of the picture.

The rod B, is to be placed in the loops on the side of the clamp, the eye piece F fixed in it at any height or distance that may be considered most convenient for viewing the object to be drawn, and the instrument is ready for use. The method of obtaining the perspective representation of right lines and curved objects having been before described, it will be unnecessary to repeat it; we have only to observe, that the whole instrument can be packed up in a case 12 inches long, 3 inches wide, and 2½ inches deep.

PAPERS

IN

MANUFACTURES.

The SILVER ISIS MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* STEPHEN MARSHALL, *at the Prince's Head, Streatham, in Surry, for a Calico Printers' Block, of a new Construction. The following Communications were received from him, an explanatory Engraving is annexed, and the Printing Block is preserved in the Society's Repository, along with Specimens of Calico printed therewith.*

SIR,

PERMIT me to lay before the Society, a mechanical improvement which I have made in the Blocks for printing calicoes, which I think will be of advantage to the public. The invention is quite new: I have never shewn it to any one till within this month. I made it, and printed the goods

goods I have sent with it. If I had made the pattern much closer, it would perhaps have had a better effect with the Society. As you are acquainted with the nature of calico-printing, you will oblige me by explaining the principles of its construction and application.

I have sent herewith a Certificate from Mr. Sutherland, a gentleman well conversant in this business, and I have added some new patterns of the stile of work to which this invention is applicable, and which cannot be executed in the common mode of callico-printing.

I am, Sir,

Your most obedient, humble servant,

S. MARSHALL.

Streatham, May 3d, 1814.

To C. Taylor, M. D. Sec.

*** Mr. Marshall, the inventor, on attending the Committee, explained to them, that by one block on this construction, two different colours can be printed at one stroke of the block; and thus a new style of work can be executed, and the finest designs completed, without showing any joining mark on the cloth.

That, in the block produced, which is a striped pattern, the stripes are formed of slips of copper let into the wood, and so contrived, that a certain number of them can rise above, or sink below the surfaces of the others, or form a level surface with them at pleasure; so that if a black and red colour are to be printed at once on the cloth, the red stripes being furnished with colour from the sieve by turning

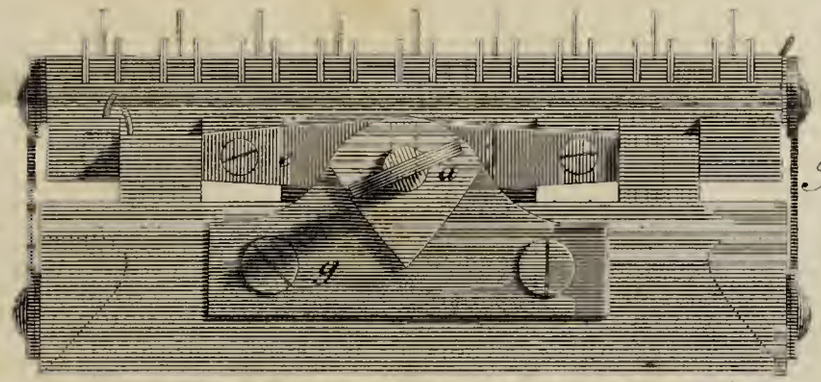


Fig. 6.

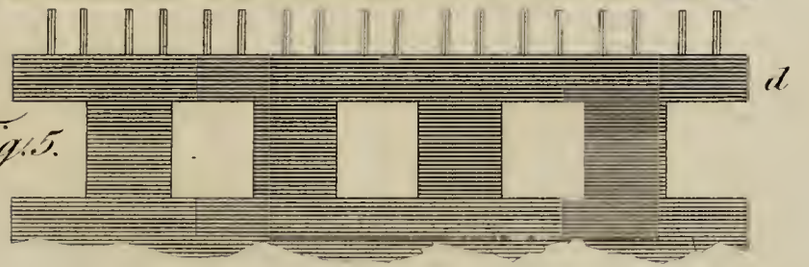


Fig. 5.

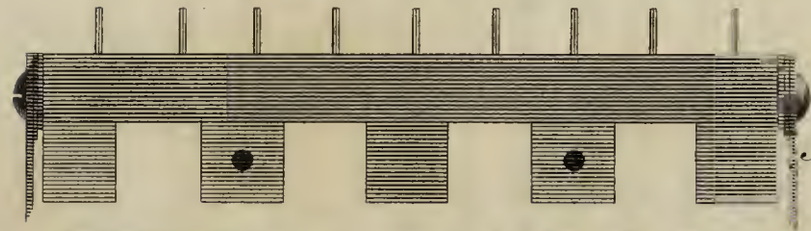


Fig. 7.

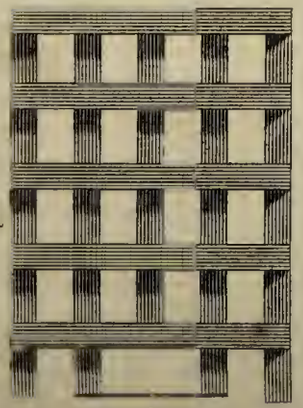


Fig. 2.

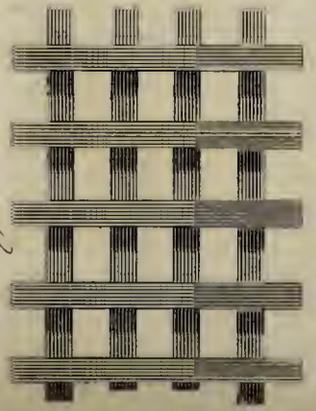


Fig. 4.

Fig. 2.

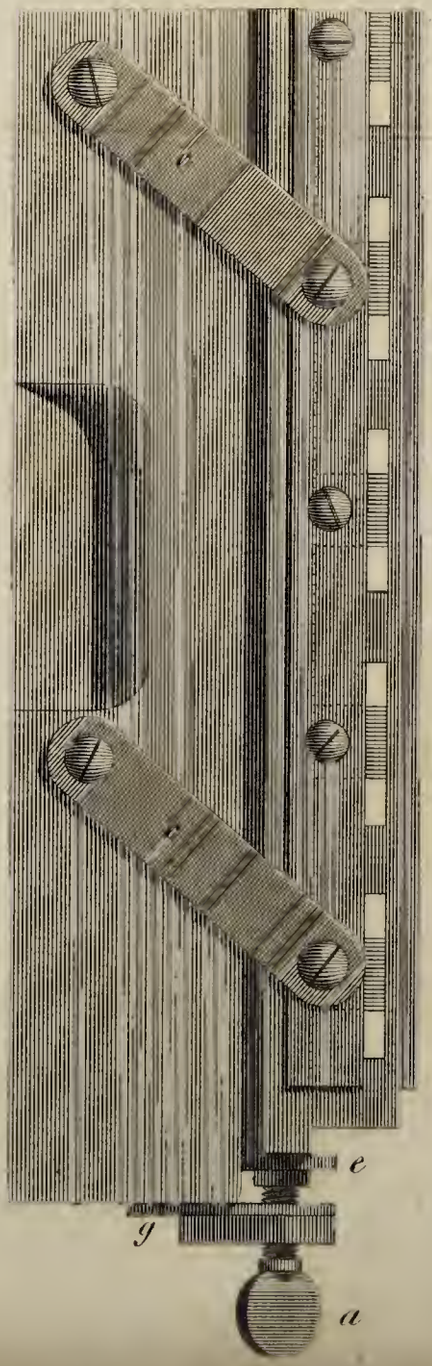


Fig. 3.

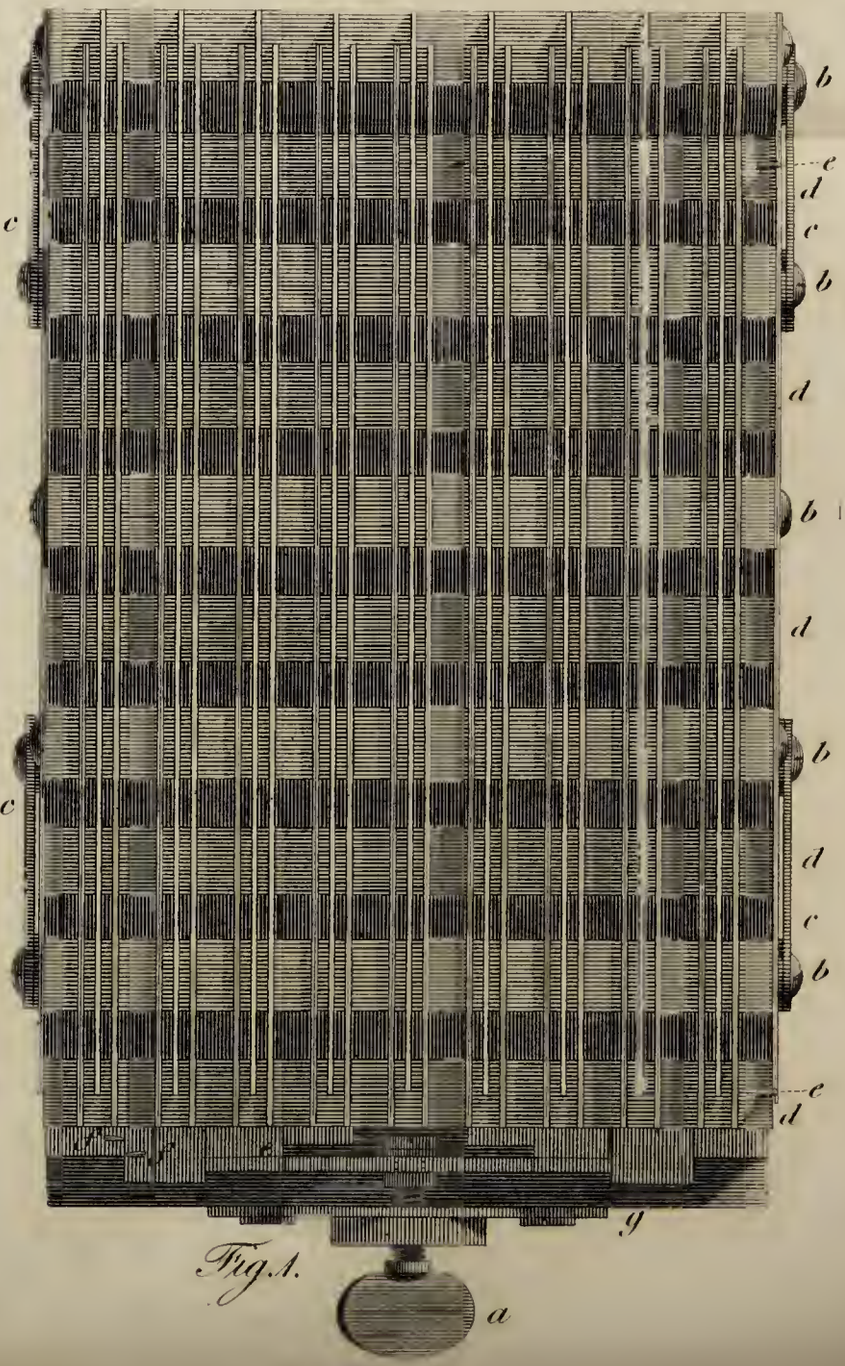


Fig. 1.

Mr. T. Marshall's Callico Printing Block.

Cornelius Varley delin.

J. Brown sculp. 291 Holborn Hill.

turning a screw, are drawn down within the others on the block, whilst the black stripes remaining, are furnished with colour. Both parts of the block being thus supplied with their respective colours, are then brought to a level, by turning a screw with the left hand, till the two regulating pins near the screw are upon a level and in a line. The block is then laid on the cloth, and struck with the printer's mallet in the usual manner, delivering the impressions of both colours at once upon the cloth. During the whole operation, the printer needs never to quit hold of the block with his right hand, and custom so soon reconciles the management of the screw with the left hand, that the block needs not to be looked at whilst receiving either colour, but merely to be examined when both are finished, to see that the two regulating pins near the screw are placed in a line, and on a level just before the block is laid upon the cloth. Patterns so delicate as to be impossible to be worked in the common way, can thus be perfectly executed, and with great facility. Another advantage possessed by printing blocks on this principle is, that one block can be made to produce a great variety of patterns; for instance, in the case of this block of Mr. Marshall's, formed to print straight parallel lines only, it is evident, that the wide single lines, lying between the double ones, when elevated above them, form one pattern; the double ones, when the single ones are depressed beneath them, form another, the lines being nearer together; and, when all the lines on the surface are brought even, they form another pattern with still closer lines.

CERTIFICATE.

SIR,

THIS day Mr. STEPHEN MARSHALL showed me a block to print two colours at once for the use of callico-printers, and about two yards of callico printed by it. I beg leave to say, that I think it the most ingenious printing I ever saw, from my experience of twenty years, in which I have carried on the printing business in the neighbourhood of London. I conceive such patterns cannot be executed upon any other principle, and that it is capable of being extended to many patterns, which the printers before could not undertake. I think this block will enable one man to do the work quicker, and with more accuracy.

This print may be applied to any pattern, and probably to more colours than two. But there are many patterns that cannot be done on any other principle.

Mr. Marshall's print appears to me the only improvement certain to be of utility, in the mode of printing, called block-printing, that has been produced for the last forty years.

I am, Sir, respectfully,

Your obedient, humble servant,

G. SUTHERLAND.

No. 18, *Park Place, Kennington Cross,*
May 5th, 1814.

TO C. TAYLOR, M. D. SEC.

Reference

Reference to the Engraving of Mr. S. Marshall's Calico Printing Block. Plate 3. Figs. 1 to 7.

Fig. 1 is the printing block, with the middle line of each series raised above the two others, by the thumb-screw *a* being screwed in; either for printing single lines, or for taking the colour, and then, by the screw *a* being turned back, they may be sunk below the other two outside lines, which may then be either used by themselves, or covered with a different colour; and then, by again screwing up the single lines, till the two regulating-pins *f f*, fig. 1 are on a level, they are all made even, and will print together; *e e* are two pitch-pins for marking dots to guide the printer as usual. *f f* are two regulating-pins, the one on the fixed, and the other on the moveable part of the block, which, when both are brought in a line together, shew that all the three lines of each series are even on the surface.

The middle lines are carried by the alternate bars, *b b b b b*, which are fastened on other moveable bars, as fig. 2 2 and 7; and this frame is attached to the block, like a parallel ruler, by copper bars, as *c c*, figs. 1 and 3, on each side of the block, so that by the alternate motion of the screw *a* they are raised or lowered.

All the outside lines of each series are carried by the alternate bars *d d d d d*, figs. 1 and 5, which are fastened to other bars, as fig. 4, 4 and 5, and this frame is immovably fastened to the block itself, as in figs. 5 and 6.

Fig. 6 is an end-view of the block, with the middle lines only raised.

Fig. 5 shews how the cross-bars *d* are cut away over the 5 bars of fig. 7, to let them rise up. The point of the

screw *a*, is made cylindrical, and moves in a slit in the plate *e*, fig. 6, between two washers, adjusted by another screw at the end of the screw *a*; and the screw itself works in a female screw attached to the plate *g*, figs. 1, 3, and 6, screwed to the front of the block.

PAPERS

IN

MECHANICS.

The GOLD MEDAL *of the Society was this Session voted to Mr.* WILLIAM HOOKEY, *of Woolwich, for his Improved Method of Bending Timber, for building large Ships of War. The following Communication was received from him, explanatory Engravings are annexed, and Models of the Invention are preserved in the Society's Repository.*

GENTLEMEN,

I HAVE invented and brought into practice, a machine for bending timber for the use of His Majesty's navy and large vessels: viz. floor-timbers, futtocks, breast-hooks, long riders, beams, knees, &c.

The constant want of compass timber, and the difficulty of obtaining it, is apparent, and seems to increase every year. The consequence is manifest to all persons who have knowledge of ship-building, and the high importance of whatever relates to the British navy, requires no comment.

The method adopted by me, has not only the effect of lessening the consumption of timber, but of adding strength to that which is used, as the timber can be worked much longer without being cut across the grain, which is frequently the case, and indeed unavoidable in the usual mode of moulding ship-timbers.

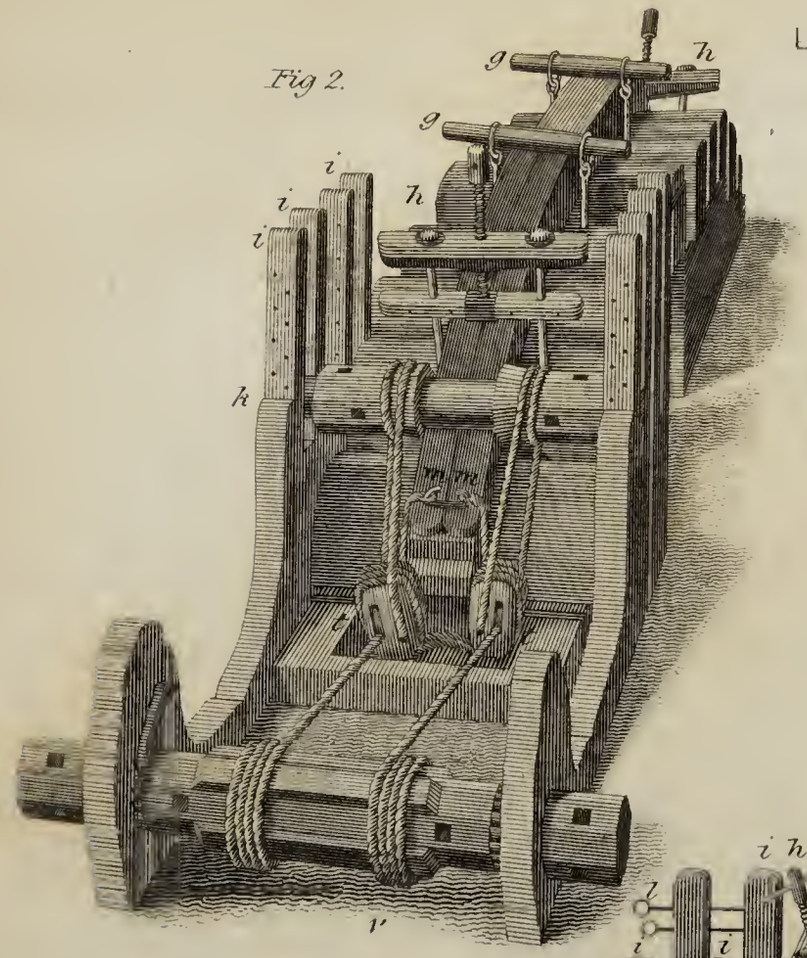
In the building of a seventy-four gun-ship on my plan, a saving will be made of about fifteen hundred pounds, and a general saving to the country of fifty thousand pounds per annum, in ship and boat building; and this is not the only advantage, as my mode will give a constant supply of timber, which cannot otherwise be obtained.

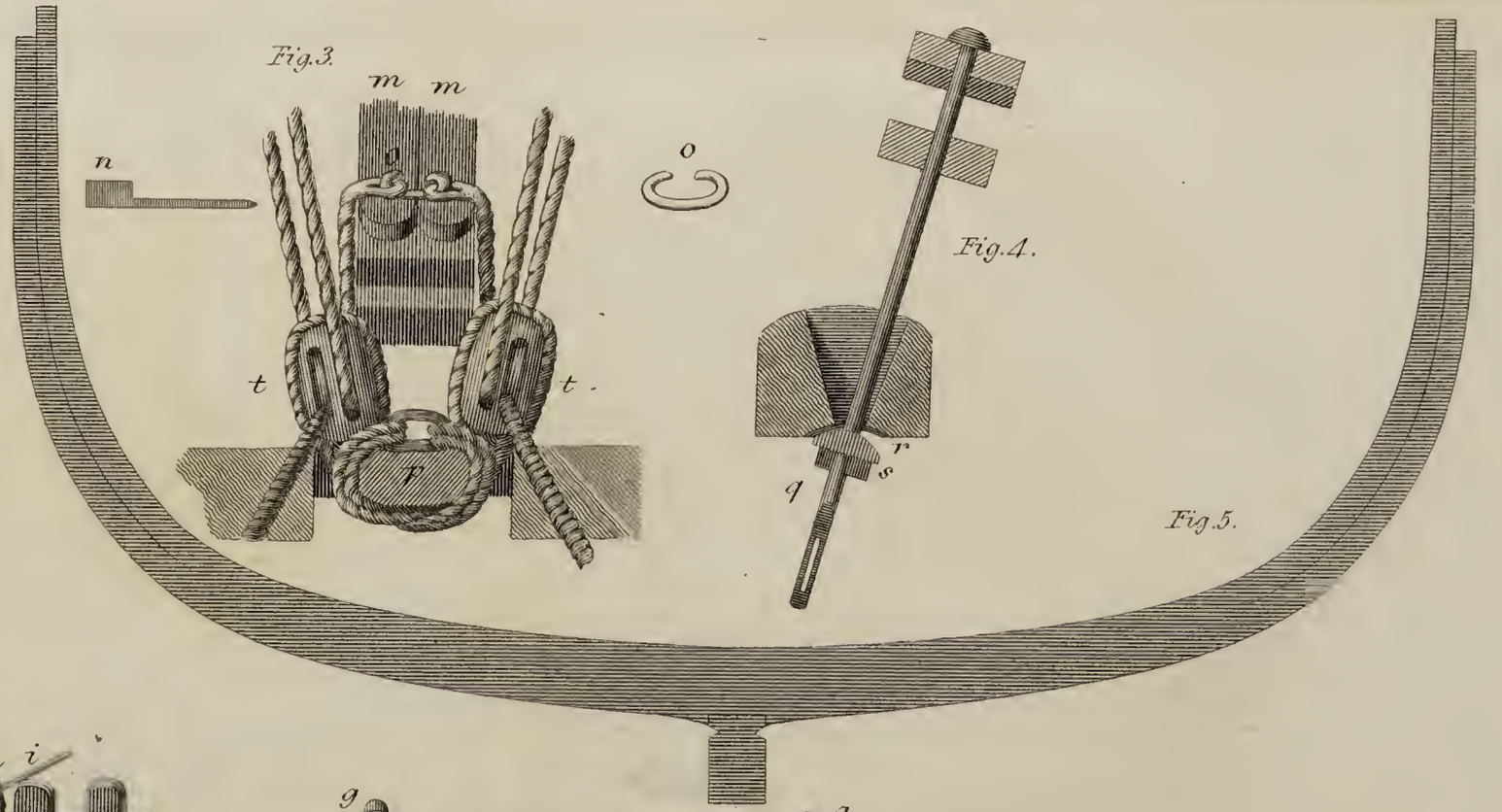
My plan has been tried, and found to answer every end intended, and is likely to become a general benefit to the united kingdom.

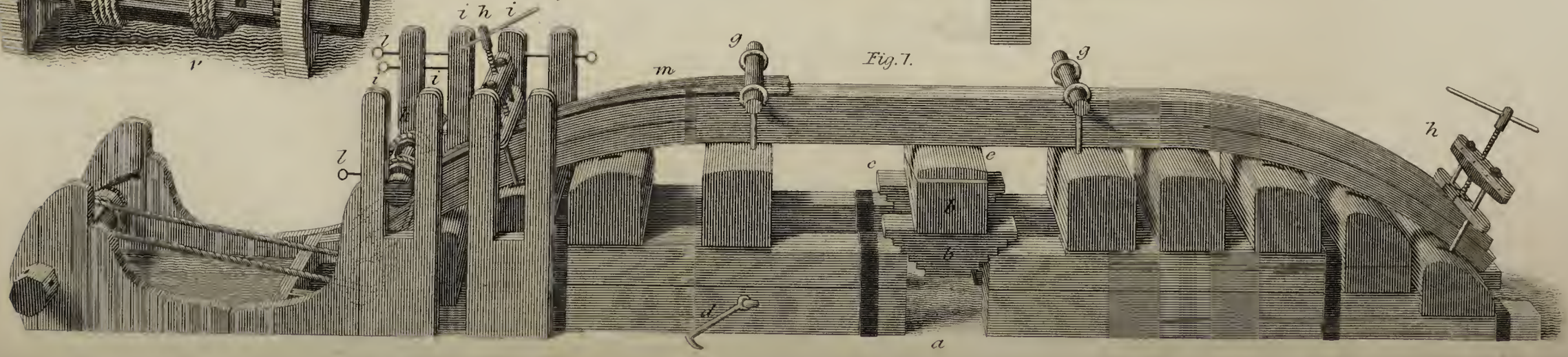
I have been a servant to the public 38 years, and have for some years made it my study to accomplish this purpose; and I am confident the saving will be immense, and the ships and boats much stronger.

I beg leave to state, that on May 2nd, 1813, I bent the largest piece of timber that ever was bent in England, to a four-feet eight-inch curve, in thirty feet long, and sixteen inches square, for a floor timber for the Black Prince, of seventy-four guns, in eight minutes time. This was a saving of twelve pounds sterling in one floor timber.

I hope







Drawn by Cornelius Varlau

M.r W.m Rocker's Machine for Binding Large Ship Timber

I hope this invention will be found deserving of the attention of the Society.

I am, Gentlemen,

Your most respectful, obedient Servant,

WILLIAM HOOKEY.

To the Society of Arts, &c.

Woolwich, Jan. 28th, 1813.

CERTIFICATES.

IN pursuance of Commissioner Cunningham's directions of the 2d February, 1813, we have caused a trial to be made of the plan invented by Mr. Hookey, master boat-builder of this yard, for bending large timber, and the undermentioned articles have been brought to the curves required from streight timber: viz.

English oak, 3 pieces. } For floors for the Black Prince,
Canada oak, 4 pieces. } the curve about four feet.

The above, when taken off the machine, came up from $1\frac{1}{2}$ to 2 inches, and were brought to the form required without injury. The time of bending the above floors, was from eight to ten minutes; and, in our opinion, the bending of large timber on Mr. HOOKEY's plan, is an object deserving every encouragement.

E. SISON, Master-Shipwright.
WM. STURE, } Builders Assist-
G. BODY, } ants.

Woolwich Yard, July 14th, 1813.

SIR,

IMPRESSED with a due sense of the great services which the Society of Arts, &c. render to the world, I beg leave to make some further observations on my method of bending large timbers, which many persons have thought impossible to be done, till by my perseverance they saw it accomplished.

I have bent the largest pieces of oak timber that ever were bent in this country, and with great facility; and before the invention of my machine, recourse was had of late years, to make the curves out of two or three pieces, which of course consumed more timber, and required a considerable expense in workmanship.

My machine has been repeatedly tried in His Majesty's Dock Yard at Woolwich, and has answered every intended purpose. The floor timbers for the Black Prince, of 74 guns, have been bent in nine minutes; and a breast-hook for the Nelson, a first rate man of war, which is bolted between the upper and middle deck, made out of English oak, and also long timbers in a serpentine form.

I beg leave to make some remarks on oak timber, which I have learnt from experience, viz. that Sussex oak is the best in the world for elasticity and durability. That which grows on the South-west parts of Kent, and North East part of Hampshire, is next in quality. Previous to the timber being steamed and bent, an horizontal cut is made with a saw, which answers two purposes; it gives ease in the operation of bending; when the two parts are bolted together, the return of the timber to its former shape is more prevented. It also removes the gore piece at the butt end, when it is shaken or defective, which is frequently

Mr. Wm. Hockey's Machine for Binding Large Ship Timbers.

Fig. 3.

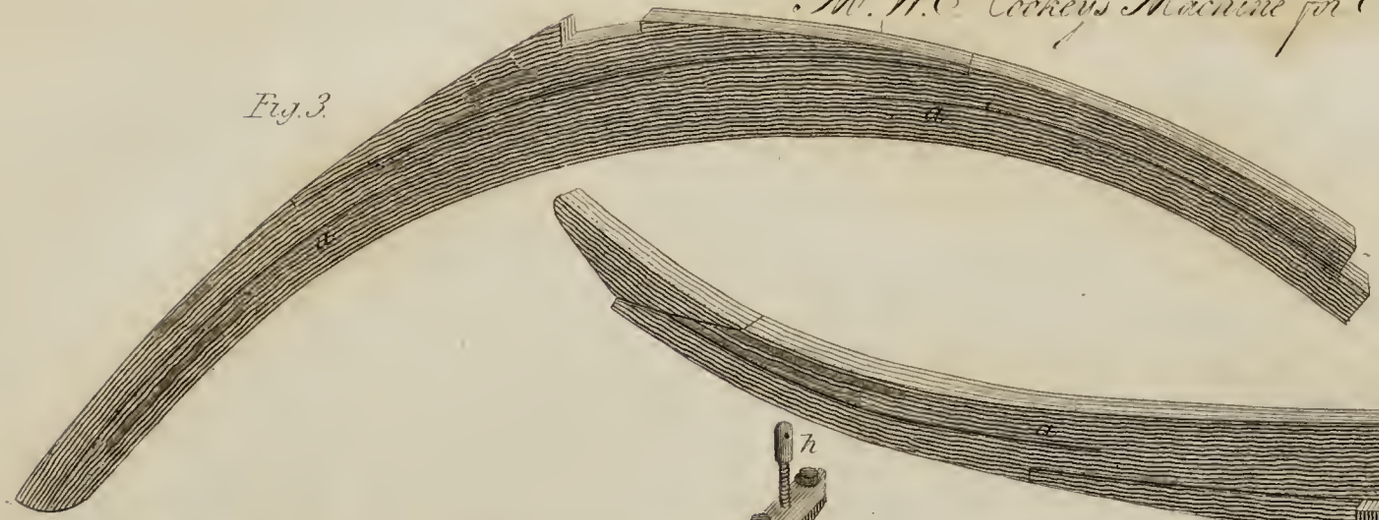


Fig. 2.

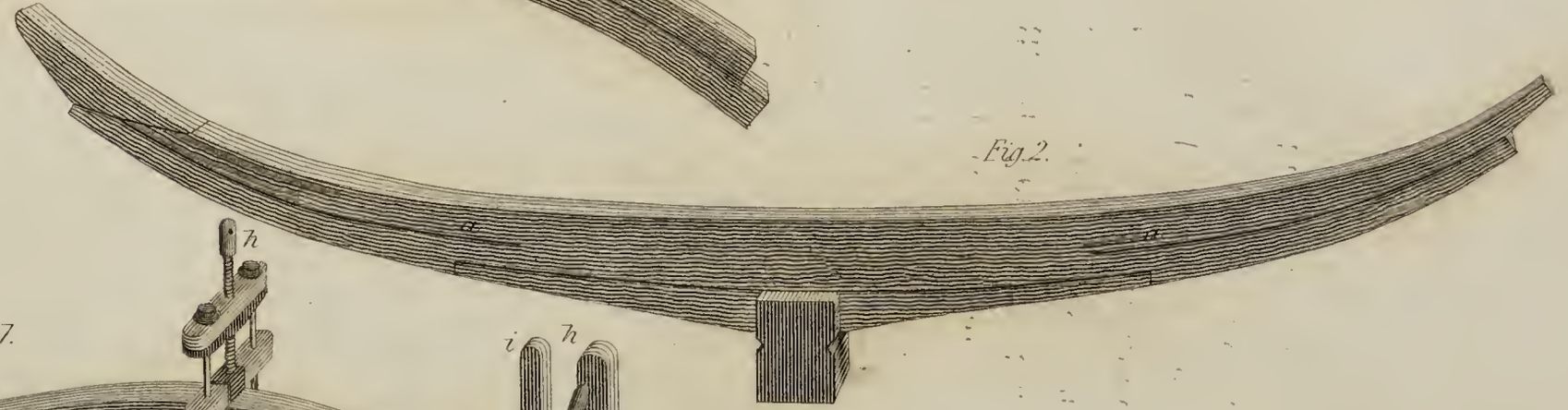


Fig. 1.

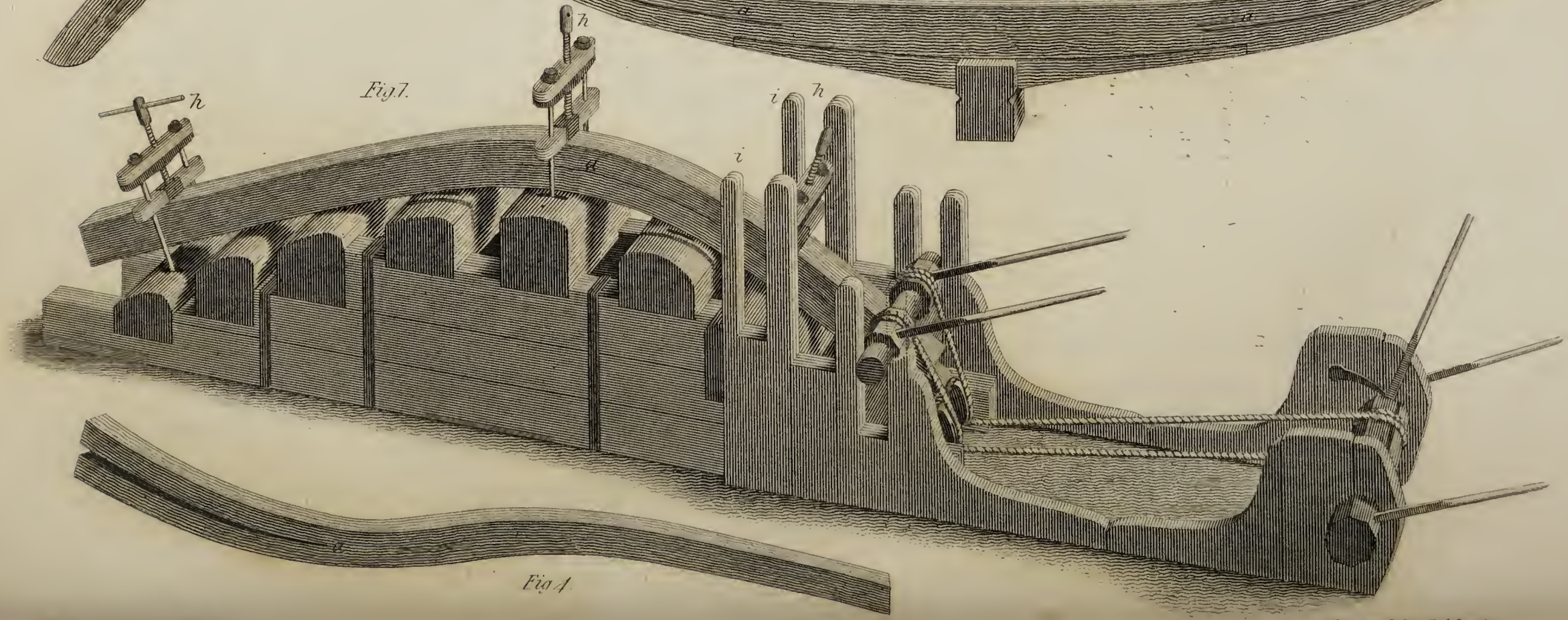


Fig. 4.

Drawn by Cornelius Varley.

Engraved by Jas. Davis.

frequently the case. After the operation, the inner curved part will be found rather longer than the outer one, and forms an useful abutment in fixing the timbers at its ends.

I beg leave to subscribe myself, Sir,

Your most obedient, and very humble servant,

WILLIAM HOOKEY.

Woolwich, July 6th, 1814.

To C. TAYLOR, M. D. SEC.

Reference to Mr. HOOKEY'S *machine for bending Ship Timbers, Plate* 4.

Fig. 1, is a side view of the machine, on a scale of $\frac{1}{12}$ part of the real size, as adapted for bending midship floor-timbers, which have previously been either boiled or steamed.

The machine is divided in the middle at *a*, so as to alter its length for different sized timbers, and is kept apart, to the required length, by the suitable notches of the adjusting blocks *b* and *c*, the pressure against these being very great; hooks, one of which is shewn at *d*, are fixed on each side of the front or moveable half, to catch in holes or rings in the floor, to assist in retaining it: the other half is firmly fixed. On the adjusting blocks are placed two opposite wedges *c* and *e*, similar to those used in shoring up ships, in Mr. Sepping's mode, to support the middle of the timber; on the next blocks are iron rings, with a wooden bar through them, to keep down the timber; but screws as *h h*, are generally preferred: *g g*, *i i i i* are uprights for the windlass or capstan *k*, which may be put in

that part which best suits the timber, and when brought down by the action of the levers, the timber is secured by the screw press *h*; *b b* are iron bolts to keep the windlass down, as soon as the timber is bent.

Fig. 2, is an end view, to shew the combined action of the two windlasses and blocks. Iron plates, *m m*, are laid on the timber, to prevent the grain from rising, the ends of which are thickened with heads, *n*, fig. 3, to keep the ropes from slipping off; the ropes are united by a double hook or open link *o*, fig. 3, and then passing through the blocks *t t*, fig 3, (which are also attached to the floor by their ropes going once under the middle timber *p*, and then lashed together above by a smaller rope,) are twice wrapped round the first windlass *k*, figs. 1 and 2, and passing again through the blocks, are fastened to the second windlass *v*; by this means a great pressure is obtained. Fig. 4 shews the manner of fastening the bolts of the screws *h* to the blocks, the holes are widened as the Roman letter V, to let the screws accord with the bend of the timber, and to suit different-sized timbers; the bolts *q* have two or more loop holes at the bottom, to pin the convex nut *s* on; this nut rolls in a less concave iron plate *r*, let into the bottom of the block. Under the upper wooden bar of the screw press is a plate of iron, having a female screw in which the screw works, and its point pressing against a band of iron which encircles the lower bar, forces them asunder in action.

The machine is built upon three floor timbers, the middle one *p*, fig. 3, is thinner than the other two, to let the block ropes pass under.

Fig. 5 is Mr. Hookey's plan to make eight midship launches framed out of one piece.

Plate 5.

Plate 5, fig. 1, is another construction of the machine for bending different shaped timbers, in which the alteration is made, by disposition of the chocks or cross blocks.

Fig. 2, is a floor timber of a 74 gun-ship of one piece.

Fig. 3, a breast hook of one piece.

Fig. 4, a top timber, similar to that in the machine.

The timber is first sawn down the middle, as far as it is to be bent, as shewn by the line *a*, in the different timbers, which greatly increases the power of bending it, and permits the one part to slide over the other, so as to lessen the tear of the different parts; which are afterwards secured together by bolts passed through them, and may be still farther stiffened, by the additional pieces let into them, as shewn at fig. 2 and 3.

Fig. 1, being on a larger scale, affords an opportunity of showing the hands, pikes or levers placed in the holes in the windlasses or capstans, by the joint action of which the timbers are forced into the requisite curves, to suit which the blocks must be previously arranged, as well as the beams which support them, and which are so managed, as to form buttresses to prevent the blocks from shifting their places, in the act of bending the timber; and the whole is securely united together by iron bands, &c.

The

The SILVER MEDAL, *and* TWENTY GUINEAS *were this Session voted to Mr.* PETER HEDDERWICK, *of Lower East Smithfield, for a double piston Pump, yielding double the usual quantity of water from the same bore. The following Communication was received from him, an explanatory Engraving is annexed, and a working Model of the Pump is preserved in the Society's Repository.*

SIR,

I BEG leave to inform you, that I have made a considerable improvement in the working of ship's pumps, and that I wish to submit the utility of this invention to the Society of Arts, &c.

I am, Sir, respectfully,
Your obedient humble Servant,
PETER HEDDERWICK.

St. Andrew's Tavern, Lower East Smithfield,
November 30th, 1813.

To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. HEDDERWICK'S *double Piston Pump.* Plate 6.

Figs. 1, 2, 3, represent three methods of fitting up these pumps, but as they have nothing peculiar in them, the description will be confined to that part wherein consists the novelty of this invention.

In the pumps with double pistons hitherto made, the piston rods have been attached to one side of the pistons, thereby

thereby giving an unequal pull upon the pistons, whereas in this contrivance, they are attached to the centre of the piston, the lower piston rod passing through the centre of the upper piston.

The method of doing this is more particularly shewn in figures 4 and 5. In figure 4, K K D D is part of the piston rod of the upper piston, with two branches D D, jointed at D D to the piston F F.

G G is part of the piston rod of the lower piston, passing through the cross bar F F, which is attached to the top of the upper piston; E E, is another cross bar, by which the piston rod G G passes.

The jointed piston as here shown, is only necessary in large pumps. In smaller ones, the joint D, and the bar E E, may be dispensed with, and thus the piston rod may be all in one piece, fastened to the top of the piston box at F F, the pliancy of the rods rendering the joint at D needless.

Fig. 5, represents the top of the piston, with the cross bar F F, through which the lower piston rod G G, fig. 4, passes at I. The two valves are formed of one piece of leather in the usual manner, which is confined under the bar or cross piece F F, and is strengthened by having two plates of iron rivetted upon it, one on each valve, the valves being what are usually termed butterfly valves.

The principle will appear from the manner of working the pump, as follows:

In figure 1, A B C D H, is a handle or bent lever, upon one side, and M N L K I, a similar one on the other side of the pump, by which the power is communicated to the pistons; the lever A B C D H is moveable round the fulcrum or centre D, and the lever M N L K I round the

centre

centre K; the extremities I and H are connected by a bar I H, so that when the end of the one lever A B is depressed, the other M N is raised; the straight parts C D and L K of the levers are continued to E and O, beyond their centres of motion D and K, so as to be as nearly over the centre of the bore of the pump as possible, but free of each other in the operation of working.

By this connexion, when the handle A B is depressed, the handle M N is raised, the piston G is depressed, and the other piston F raised. This motion being reciprocally continued, gives a double advantage in lifting the water; for, when the one handle is pulled down, the piston attached to that handle is raised, and when the same handle is raised up, the piston belonging to the opposite handle is also raised.

Figs. 2 and 3, represent two other modes of working this pump, but for the reasons above given, they need not be particularly described.

*** From the construction of this pump with two pistons, it appeared evident, that the pump barrel would raise twice as much water in the same time, as two others of equal bore with one piston each; a benefit of sufficient importance in many cases of accidents at sea, but upon a comparative trial before the Committee of Mechanics, it turned out, that the pump with two pistons actually raised *twice and a half* as much water, as another pump with one piston only, which was connected with it, so as to make equal strokes therewith, did in the same time, a difference in favour of the pump with two pistons so remarkably great, as to occasion doubts in the minds of the Committee, whether the pistons or bore of the double piston

pump

Mr. Peter Hedderwick's Double Piston Pump.

Fig. 3.

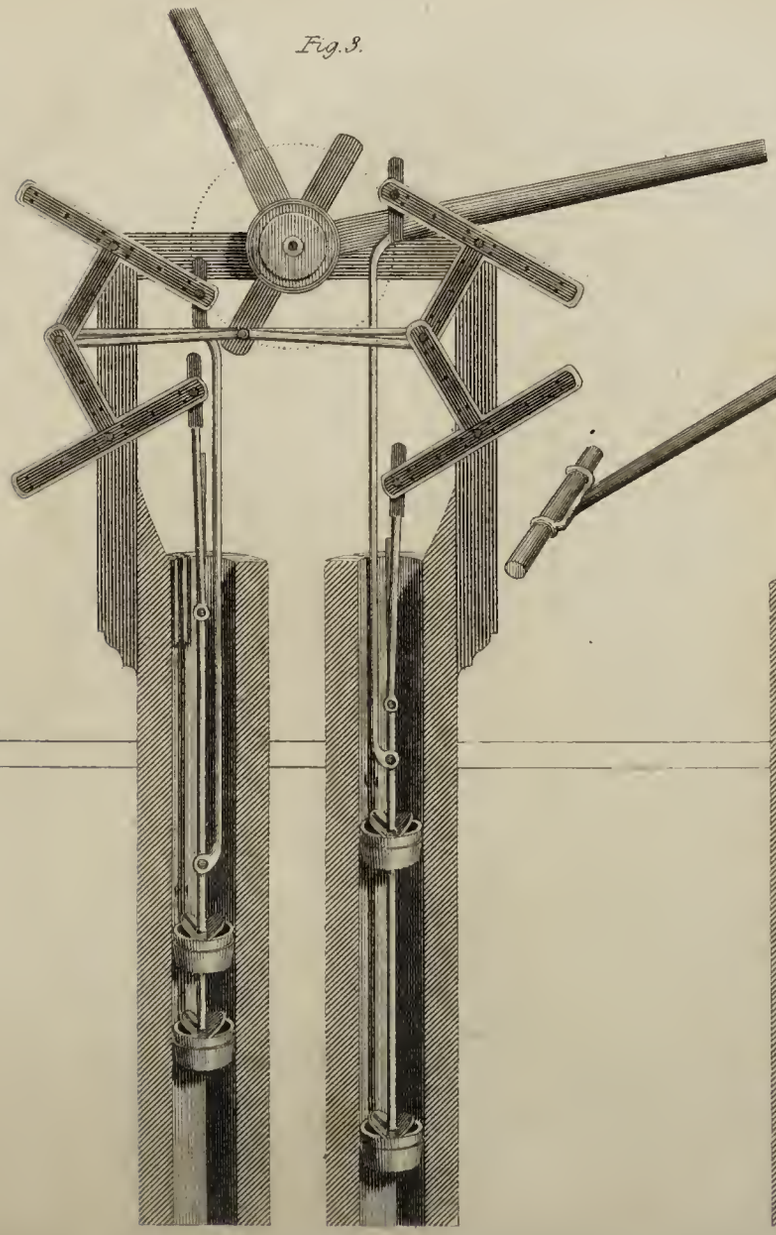


Fig. 2.

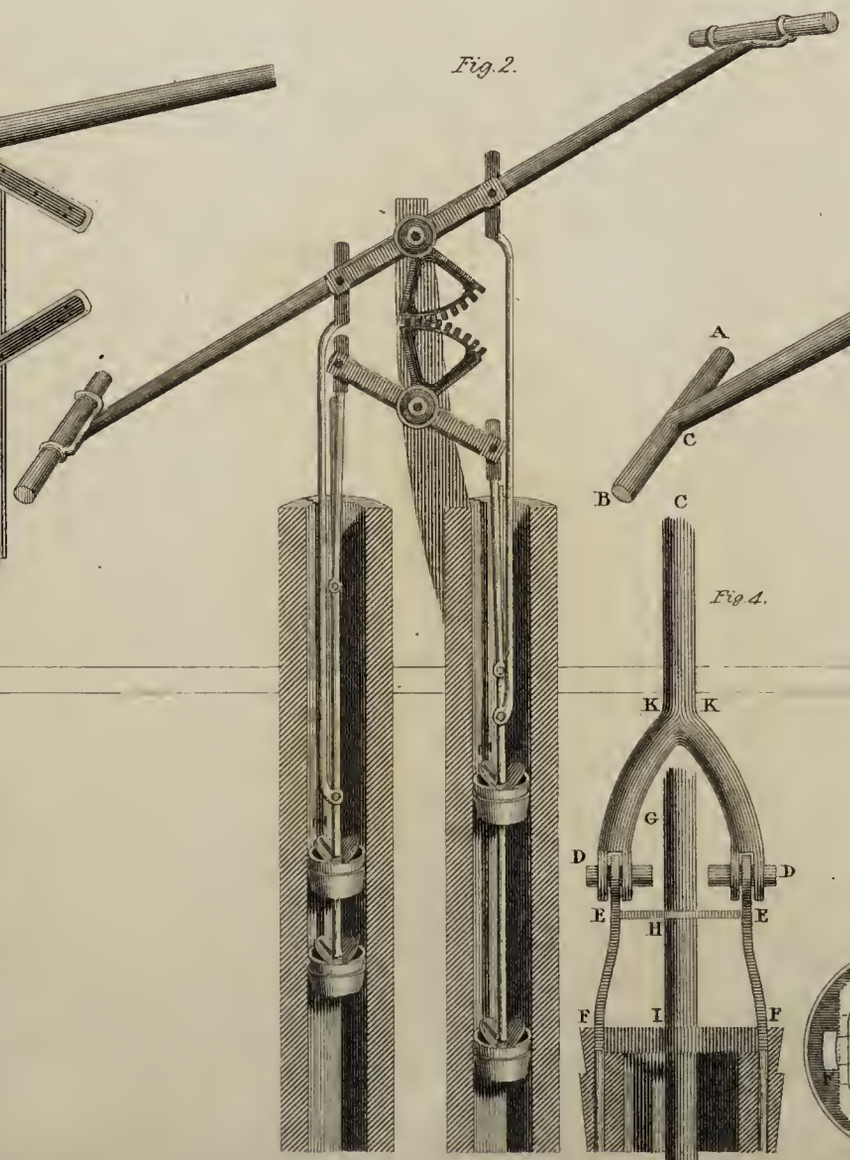


Fig. 4.

Fig. 5.

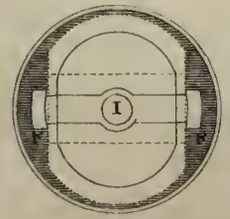


Fig. 1.

A

B

Drawn by W.A Nicholson

Engraved by Js Days

pump might not have been more accurately formed, than in that with a single piston ; on this account, they shifted the pistons from the one barrel to the other, but, on repeating the experiment, the result was the same as before; a convincing proof that the experiment was a fair one, and in fact, the difference in the effect of the two pumps can be perfectly well accounted for, by the consideration that in the pump with a single piston, the water, after being put into motion by the action of the pump, is suddenly stopped by the change of motion during the descent of the piston, and has to be again put into motion at every stroke of the pump, to the great hinderance of the regular discharge of the water; whereas, in the pump with two pistons, the flow from it is nearly continual during its action, the one piston constantly ascending, whilst the other is descending, and the momentum of the water continuing its ascent during the change of motion in the pistons, and thus producing the very great difference in favour of the performance of the pump with two pistons ; neither does this pump ever require double the force that is applied to one with a single piston, to work it, it being much easier to continue a motion when commenced, than to renew it perpetually when interrupted as it is in the pumps with one piston only.

The SILVER MEDAL *and* TWENTY GUINEAS *were this Session voted to Mr.* CHARLES WILLIAMS, *of Hatfield-street, Black Friars Road, for a Portable Corn Mill for Family Use. The following Communication was received from him, an explanatory Engraving is annexed, and a Mill on this Construction is preserved in the Society's Repository.*

SIR,

HAVING had various applications for hand corn mills, and being convinced that nothing but stones are calculated to grind wheat, and that in every mode which has hitherto been adopted, they have always been attended with great expenses, and occupied much room, I beg leave to submit to the Society a mill, in which I have endeavoured to obviate the above inconveniences; it is composed of a pair of French burr-stones, working vertically; the running stone works against a fixed breast, which is occasionally moved to adjust the fineness of the flour by means of a regulating screw. The mill is intended to be fixed by three bolts to a post. The simplicity of its construction, the small space it occupies, and the manner of its performance combined with its cheapness, I trust will be a sufficient recommendation of it to merit the approbation of the Society.

With this mill a man may grind half a bushel of wheat in an hour. I can now manufacture them for twelve guineas

guineas each, and have no doubt of being able to make them much cheaper.

I am, Sir,

Your most obedient, humble servant,

CHARLES WILLIAMS.

No. 20, Hatfield Street, Black Friars Road,
January 29th, 1814.

To C. Taylor, M. D. Sec.

Reference to the Engraving of Mr. C. Williams's *Portable Corn Mill. Plate 7, figs.* 1, 2, *and* 3.

A, fig. 2, the running-stone, constructed of French burr, having also a fly-wheel and a pinion upon the same axle with it, placed outside the cheeks of the frame.

I, fig. 1, shews the small pinion on the same axle with the stone A and the fly-wheel.

J, The multiplying-wheel, turning the pinion I, and thereby increasing the velocity of the stone.

K, the handle, in order to apply the power.

B, fig. 2, the moveable breast, constructed also of French burr, made to fit the running stone on one side, and cased on the other three sides with cast iron.

C, a screw to regulate the fineness of the meal, turning in a bed shewn separately at R and M, fig. 3. The side of the iron case which receives the screw, has a female or hollow screw to receive the screw at the end of Q; by this means the whole of the case is moved in a horizontal position, so that the burr-stone breast may be brought nearer

to

or more remote from the cylindric running stone at pleasure. For this purpose, the cast-iron case slides upon ledges cast on the insides of the two cheeks, which support the stone and wheel work.

D, fig. 2, the screw to adjust the feed-plate, turning in a notch or bed, on the top of the moveable breast.

E, fig. 1, the feed-plate, in which the screw works, in the same manner as C, fig. 2, turning upon the bolt R S, as an axis.

F, the hopper.

H, the post to which the mill is fixed.

L, fig. 2, the brush to keep the stone from clogging.

In figure 3, Q represents the screw, with a hole through its head, to receive a lever for the purpose of turning it round, and with a neck and shoulders upon each side of it, to turn in the semicircular notch M, of the bar R.

This bar has its ends bent at right angles, and fitted to grooves in the cheeks of the mill, parts of which are shewn at N, O, so as not to shake, and the whole is bound together by the rod P, which is screwed at each end, with a separate nut to each screw.

The frame of the mill is formed of cast-iron plates.

Directions for working the Mill.

The mill is intended to be firmly fixed to a post, by means of two or three bolts. The slide in the hopper must be put down whilst filling it. On beginning to grind, it must be adjusted so that the wheat may go regularly in. If the mill does not grind fast enough, the small screw in front must be unscrewed till it does, which may be known by

Mr C. Williams's Portable Corn Mill.

Fig.1.

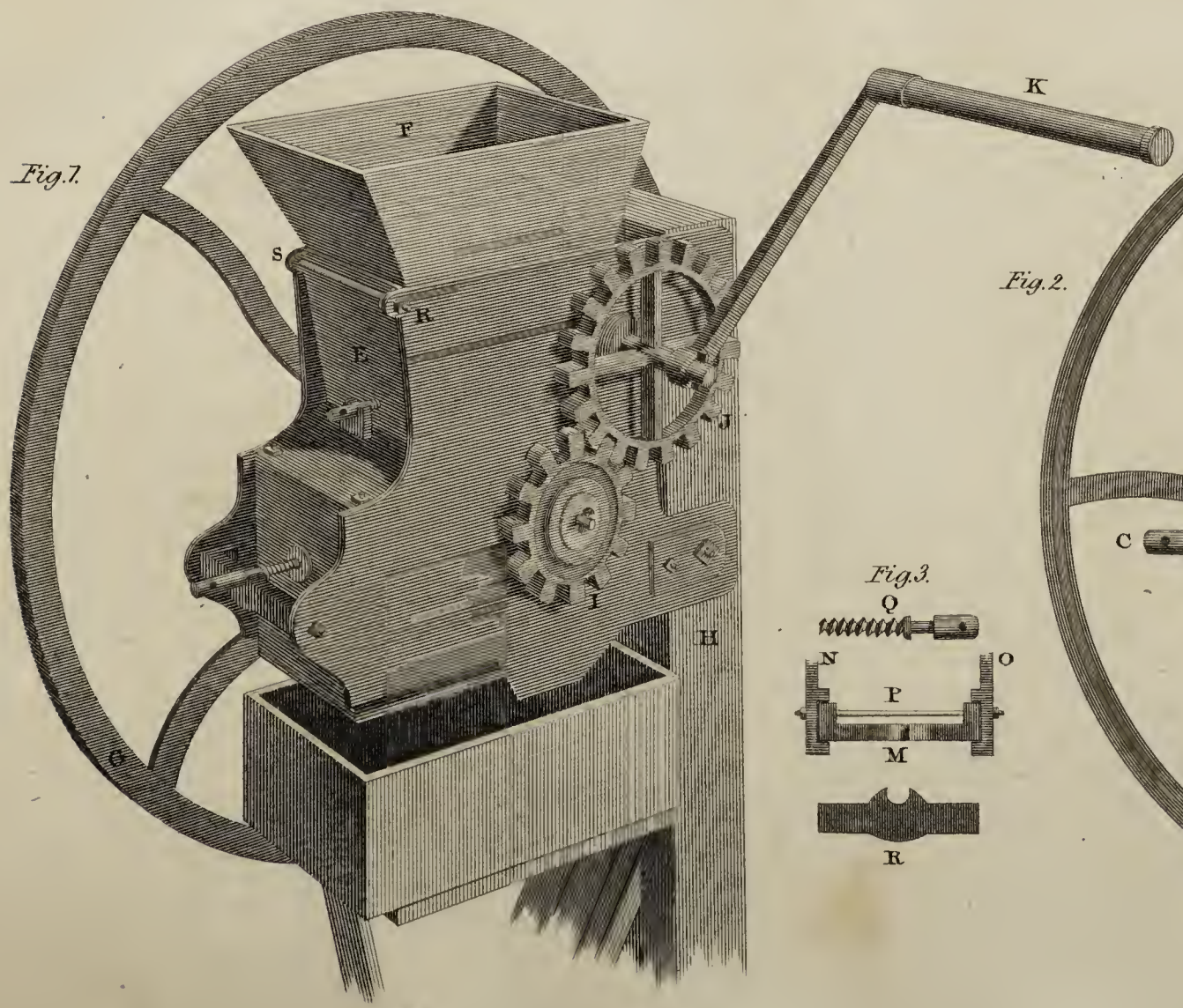


Fig.2.

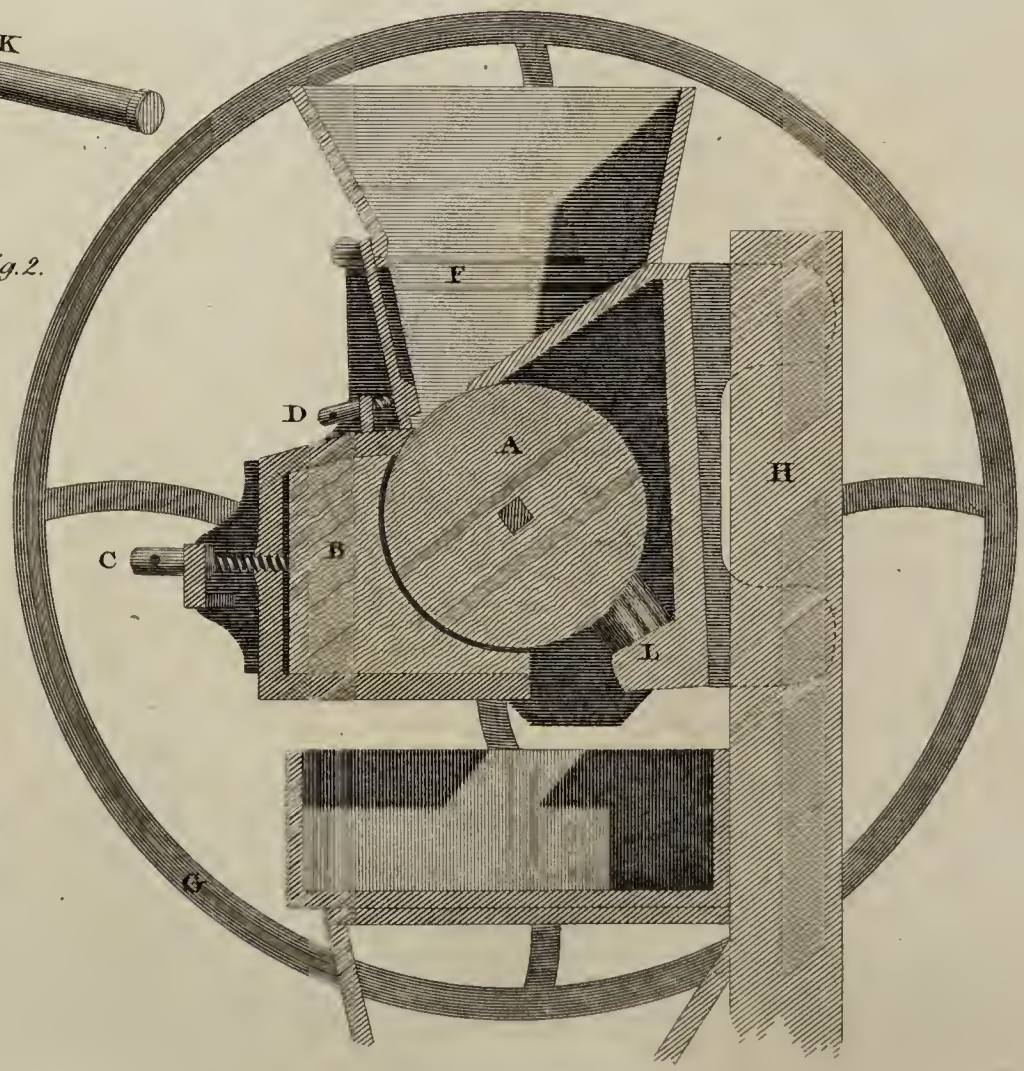


Fig.3.

Drawn by M.A.Nicholson.

Engraved by Ja.s Davis.

by its going harder; if it takes the corn too fast, so as to go too heavy, screw the same screw farther in: by this regulation any power applied may be suited. To make it grind finer, unscrew the large screw, if coarser the reverse.

*** A number of satisfactory experiments were made in the presence of the Committee of Mechanics, respecting the power and effect of this mill; and it appeared that it is free from the defect of steel mills, which rather cut than grind the corn, the wheat here being ground down in a similar way to that of the large burr-stones in common mills, and producing a clean flat bran.

The SILVER MEDAL *was this Session voted to Mr.* JOHN WOODALL, *of London Wall, for a Wind-up Bedstead, for sick or lame Persons, by which their Position can be easily altered without occasioning Pain or Fatigue. The following Communication was received from him; an explanatory Engraving is annexed, and a Model is preserved in the Society's Repository.*

SIR,

PERMIT me to lay before the Society of Arts, &c. for their inspection, a model of an improved wind-up bedstead, which is my own invention, and I trust will meet with their approbation. I had the honour to lay before

them about twenty years ago, a model of a different one, which worked with a quadrant rack on each side, and which was greatly approved at the Sick and Hurt Office. I made near three hundred of them for Government and the following hospitals, namely, the Smallpox, St. Thomas's, the London, St. George's, and the Westminster Infirmary, besides a number for private families.

The invention was also highly approved by the Royal College of Surgeons in London, and the model remains in their Museum, in Lincoln's-Inn-Fields, and I had the honour to receive their thanks for it, on January 6th, 1812, under the signature of their Secretary, Mr. Edmund Belfour. The invention now sent is much superior in construction to those above mentioned, as the present model works smoothly without any jerks, and by one rack only, which enables one attendant to raise or depress the bed at pleasure, and it remains firm in any position in which it is placed. I could furnish bedsteads on this construction, for about thirty-six shillings each, and an old bed may be easily altered to this plan. If necessary, I could by the same movement, lower the foot part of the bed, so as to make the bed answer the purposes of a chair.

I am, Sir,

Your very humble Servant,

JOHN WOODALL.

London Wall, March 1st, 1814.

To C. Taylor, M. D. Sec.

CERTIFICATES.

THIS is to certify, that the wind-up bedstead, according to the model recently presented to the Society, for the Encouragement of Arts, &c. made for the use of this hospital, appears upon trial, well calculated for its intended purposes. Signed,

WILLIAM NASH, Steward.

St. Thomas's Hospital, April 14th, 1814.

CERTIFICATES in favor of Mr. WOODALL'S improved bedstead, were also received from Mr. G. CHANDLER, Mr. JOHN BIRCH, and Mr. HENRY CLINE, Jun.

Mr. BRIGGS, Mr. DAWSON, and Mr. TOBIN, Surgeons, who were present on the examination of the bedstead by the Society's Committee of Mechanics, stated, that they had not seen any contrivance equal to the present for its intended purpose.

*** Mr. WOODALL the inventor stated, that Mr. NASH's Certificate comprized the general opinion of the Surgeons at that Hospital, and that an experiment was made there of winding up two persons, also one hundred pounds extra weight at the same time, which was performed with ease.

Reference to the Engraving of Mr. J. WOODALL'S *Improved Bedstead. Plate* 8.

Figure 1, is a view of the bedstead; A B C D is an iron frame hinged to the rails, forming the sides of the bedstead

at A and D; the ends A D and B C of this frame being bent, in order to permit the middle of the ticking to hang at liberty.

E, the rack, being the arch of a circle, toothed on its edge, and fastened to the middle of the ends of the iron frame B C and A D, the line joining the centres A and D, being considered the axis of this arch.

F F, an endless screw fitted into the teeth of the rack E, and supported at the points F F, by two opposite pivots acting in holes, one in the end next to the screw, and one at the other end or foot of the bedstead, by a piece depending from the rail.

G the handle, which being turned either way, will elevate or depress the frame A B C D, in the degree required; as is evident from this description; and in this way, a motion equable, smooth, and easy to the patient is obtained, and with the least possible labour to the nurse, and the position of the frame is firmly secured by the resistance opposed by the endless screw, to the teeth of the arch acting in it; and this, without the help of a click or ratchet, or any other noisy mode of retaining the frame in its position.

The

Mr. I. Woodalls Wind-up Bedstead!

Fig. 1.

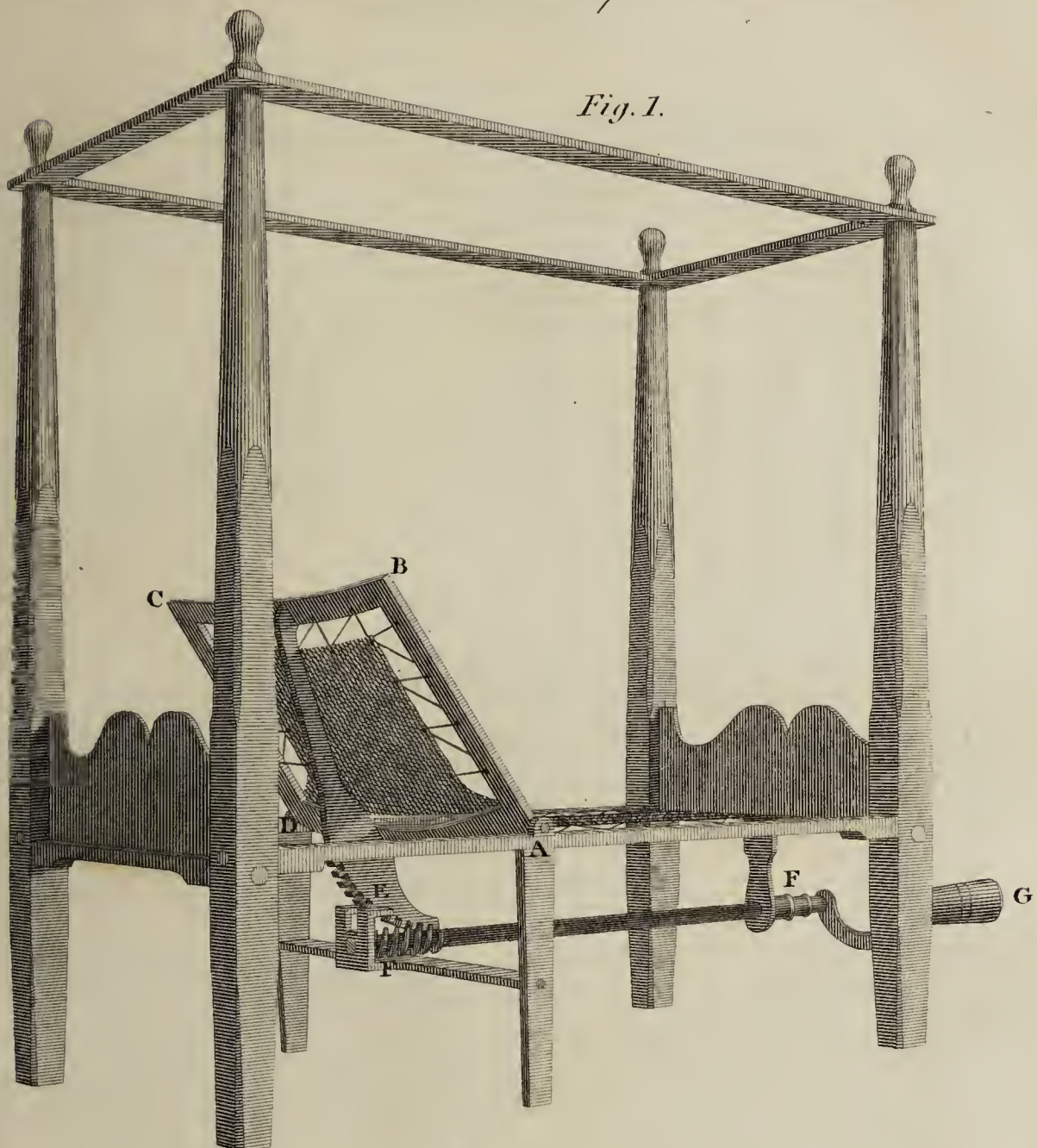


Fig. 2.

Fig. 3.

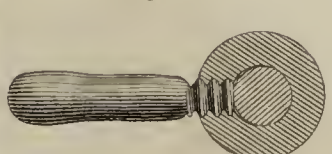


Fig. 4.

Mr. I. Laurence's Crutch!

M.A. Nicholson delin.

G. Gladwin sculp.

The THANKS *of the Society were this Session voted to* JOHN LAURENCE, ESQ., *of the London Assurance House, for an Improved Pair of Crutches for Lame Persons. The following Communication was received from him, an Explanatory Engraving is anneed, and the Crutches are placed in the Society's Repository.*

SIR,

THE crutches which I have laid before the Society, are sent with a view to the general benefit of persons who have occasion for such assistance, and will be found to possess advantages in giving considerably more ease to the shoulders and hands of the invalid, than those in common use.

With respect to the crutches, it is not my intention to claim any reward; I only beg they may be presented to the Society in my name, which the friend from whom I have received them, has authorized me to do.

I do not know the inventor or maker of them, they were procured for my friend by Mr. Miller, the late surgeon of Greenwich hospital, about four years since.

With every good wish for the prosperity of the Society,

I am, Sir,

Your most obedient Servant,

JOHN LAURENCE.

London Assurance House, March 23d, 1814.

To C. TAYLOR, M.D. SEC.

Reference to the Description of the Improved Crutch, presented to the Society of Arts, &c. &c. by Mr. LAURENCE. *Plate* 8, *figs.* 2, 3, *and* 4.

Fig. 2 represents the whole crutch, with its moveable handle *a*, in which the peculiar merit of this invention consists; this is shewn on a larger scale at fig. 3, where the handle with its screw is seen, by which it can be fixed at any height or position required by the patient, who is thus enabled to hold the crutch with far greater ease than in the usual manner of constructing it without such handles.

Fig. 4 shews the manner in which the head of the crutch is formed, so as to produce an elastic support to the patient, and thus break off the effect of the shocks occasioned by striking the end of the crutch upon the ground in walking with it; this is done by making the wood in the form of a crescent, across which, bands of linen girth web are stretched and secured firmly at each end, and the vacancy underneath them being filled with a cushion of twisted and baked horsehair: the whole, when covered with plush, velvet, &c. nailed over it, forms a very pleasant support to the patient: the lower end of the crutch has a turned conical piece of wood affixed to it, which may be renewed when worn away or lengthened to suit the height of the patient.

The SILVER MEDAL *was this Session voted to Mr.* L. BYRON, *of Princes Square, St. Georges East, for a Sinical Octant for taking Altitudes, &c. The following Communication was received from him, an Explanatory Engraving is annexed, and the Instrument preserved in the Society's Repository.*

SIR,

BEING a teacher of navigation and lunar observations, I beg leave to present, under the patronage of the Society of Arts, &c. to mariners and the public, my sinical octant, an instrument truly useful to the sailor, rendering him capable, by a single movement, to produce the answer to any question that may be proposed in trigonometry, plain, Mercator's, middle latitude, or parallel sailing; also to determine the bearing and distance to any known place almost instantaneously. In short, it comprizes all the properties of the tables of latitude and departure, either in points or degrees, and qualifies the sailor to keep the ship's account completely, without the help of scales or tables.

I am, Sir,

Your humble Servant,

L. BYRON.

15, *Princes sq. St. George's, East,*
November 10*th*, 1813.

To C. TAYLOR, M.D. SEC.

Reference to the Engraving of Mr. L. Byron's *Sinical Octant, Plate* 9, *figs.* 1 *and* 2.

This instrument consists of a flat, angular piece of hard wood B A C, of an equal thickness throughout, having upon its face either lines and figures as below described, cut into the wood itself, or printed upon paper from an engraved copper plate, and cemented upon its surface, which must be afterwards varnished; and of a moveable limb A D, turning upon a pin A, screwed into two brass plates rivetted into the piece B A C as an axis: this limb is made bevelling towards its fiducial edge, the better to read off the divisions.

The advantages of this contrivance consist in its simplicity, its easy adaptation to the uses of the mariner, and its very great cheapness; in fact, it might be very readily constructed by any one in the least degree acquainted with geometry, for his own use, by merely drawing the lines upon paper, and cementing them upon the board and limb. Its merit, however, will be better understood, by a description of its geometrical construction, and a few examples of its uses.

This octant is the sector of a circle B A C. The vertical angle A contains 45°, being the eighth part of a circle, as its name implies, or of 360°.

The leg A B is graduated into 90 equal parts, which may represent miles, leagues, &c.; through the points of division lines are drawn, perpendicular to A B, to meet the opposite side A C, or the arc B C; and for the facility of numbering or reckoning, every 10th perpendicular line from A is made stronger than the intermediate ones.

Another

Another series of lines are drawn at the same distances, parallel to A B, to meet the leg A C, or the arc B C, and every 10th line from A B is also made stronger than the intermediate 9 lines for the reason before given.

The arc B C is graduated into 45°. A moveable limb or rule A D, is attached at A to the instrument, and moveable round the same point A; the thin edge A D of the rule is graduated into a scale, the same as the side A B of the octant.

By this construction, a right angled triangle may be formed in any given proportion, and to any extent that the limits of the instrument will admit of.

The scale A B is numbered from A to B, and the scales on every 10th perpendicular to A B are numbered from the line A B towards A C. The arc B C is numbered from B towards C.

In forming any right angled triangle, it is to be understood that there must always be two given parts, and that a side of the triangle must always be one of these parts, conformable to the rules of plain trigonometry. The parts that are thus given, may be either two sides, or one side and an angle. These two sides may either be the two legs, or the hypothenuse and one of the legs. When an angle is one of the given parts, it must be concerned either with the hypothenuse, or with one of the legs.

The most usual data is an angle and the hypothenuse; though the other data forming the different cases, may be useful upon certain occasions.

In navigation, any distance measured upon the meridian between any two points or places, is called the difference of latitude of these points or places. But if a vessel do not sail directly north or south, but makes the same angle with

with every meridian she comes to, whether towards the north or towards the south, the distance from the place she sailed from, and to the place she arrives at, is simply called her distance: and the angle which she forms with the meridians, is called her course. The perpendicular distance between the point from which she arrives, and the first meridian from which she sailed, is called her departure; and the distance intercepted by this perpendicular on the original or first meridian, to the place she set sail from on the same meridian, is her difference of latitude; and thus, by only giving particular names to the parts of the triangle, instead of the general ones, as the course for the given angle, and the distance run for the hypothenuse; one of the legs is her departure, which is always opposite to the course, and the other her difference of latitude, which is one of the legs that form the course.

If it happen that the course contains a greater angle than 45°, it must be subtracted from 90°, so that, in this case, her difference of latitude will be opposite the given angle, instead of her departure; that is, opposite the angle made at A, by the moveable rule A D and the side A B of the octant.

The use of this instrument will be best explained by an example or two.

Example I.

Suppose the course to be 10°, and the distance near 80 miles, the departure and difference of latitude are required.

Bring the fiducial edge of the limb upon the course 10°: observe which of the perpendiculars opposite the angle A is cut by the moveable limb; then the departure will be found

found upon that perpendicular, to be 14 miles from the line A B to the point 80, upon the edge of the rule A D; and the difference of latitude to be 78 and about two-thirds, upon the side A B of the octant from A to the point cut by the perpendicular from 80, or the nearest within 80 in the edge A D of the limb.

Example II.

Suppose the course to be 75°, and the difference of latitude 33 miles; the distance run and departure are required.

Subtract 75° from 90°, and there remains 15°, which gives the angle opposite the difference of latitude; bring the fiducial edge of the limb A D, upon 15° on the arc B C, observe the point on the edge of the limb A D, cut by that perpendicular from A B, which just contains 33 miles: and the distance intercepted between A and this perpendicular, on the side A B of the octant, is the departure as required.

Example III.

Suppose the course to be 62°, and the departure 74 miles; the distance run and the difference of latitude are required.

Subtract 62° from 90°, and there remains 28°, for the angle opposite the difference of latitude. Bring the fiducial edge to 28°, then, from 75 on the side A B, observe the length of the perpendicular, or the next nearest perpendicular towards the centre A, from A B, to the edge A D,

of

of the limb; which will give 40 for the difference of latitude.

Example IV.

Suppose the difference of latitude to be 68 miles, and the departure 28 miles, the course and distance are required.

Take the point 68 upon the side A B, then upon the perpendicular from 68 number of 28 miles; bring the fiducial edge to the point 28 on the perpendicular, then the distance $73\frac{1}{2}$ intercepted upon the fiducial edge of A D, from A, to the point 28 on the perpendicular, is the distance run; and the angle $22°\frac{1}{8}$ contained by the fiducial edge, and the side A B of the octant is the course. In addition to the divisions above mentioned, there is likewise an arc divided into four principal divisions, and these again subdivided into halves and quarters, answerable to the points of the mariner's compass in the octant, or eighth part of a circle, which leaves it in the mariner's power either to take points or degrees, according to the accuracy of the operation required.

M.r L. Byron's Sinical Octant.

Fig. 2.

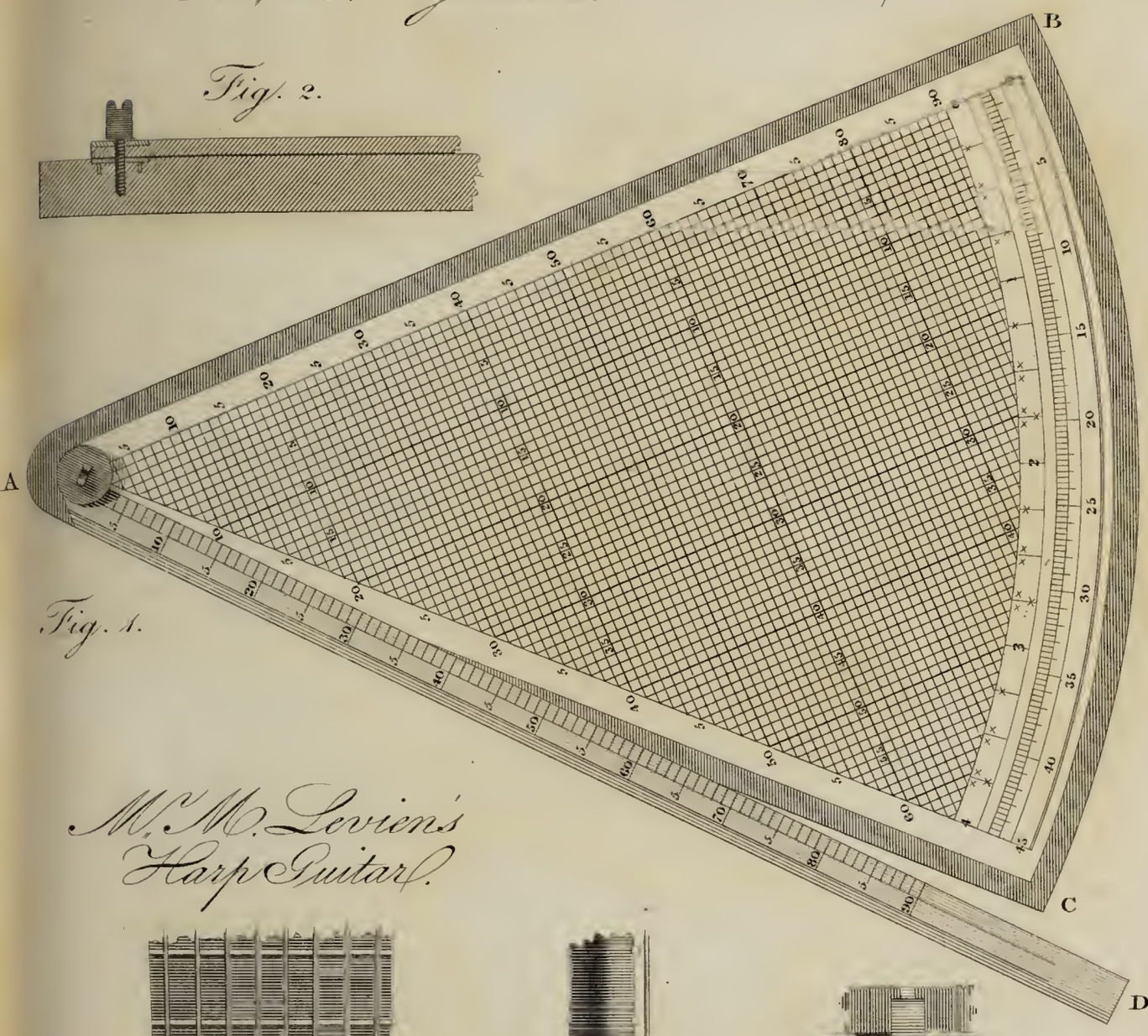


Fig. 1.

M.r M.c Levien's Harp Guitar.

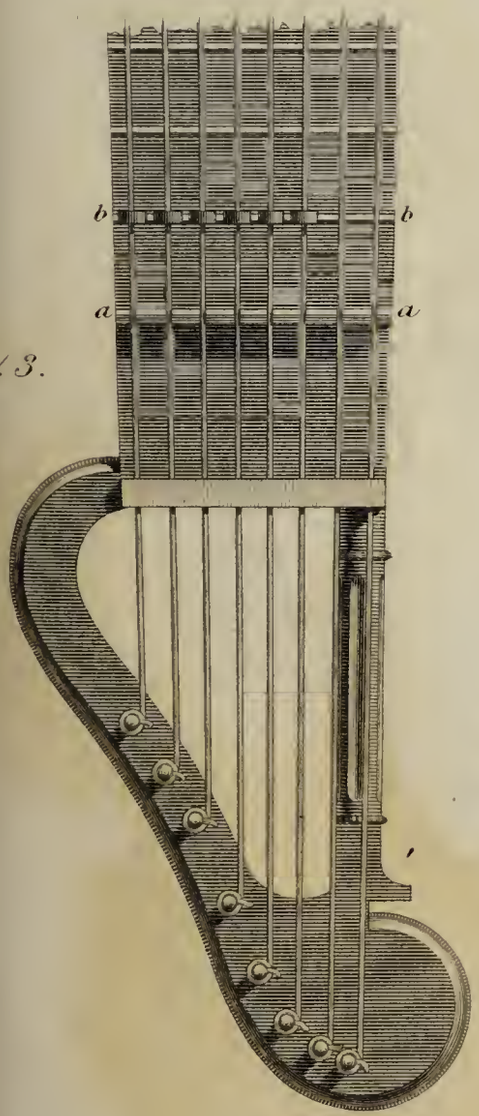


Fig. 3.

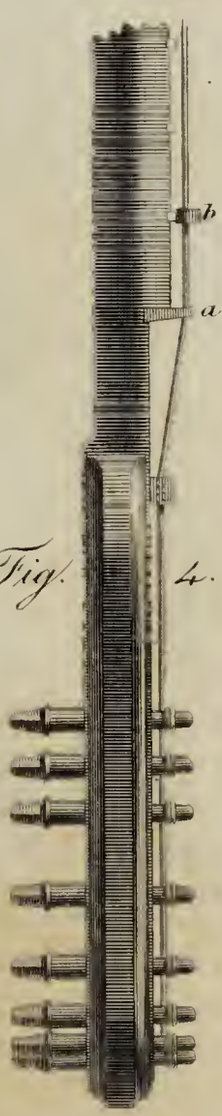


Fig. 4.

Fig. 6.

Fig. 7.

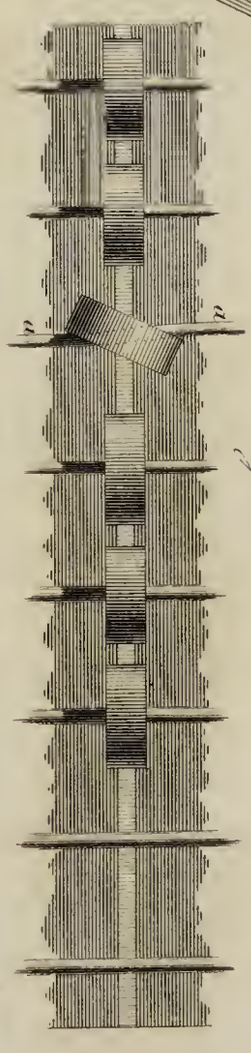


Fig. 5.

J. Nicholson delin.

J. Bacon sculp.
23 Holborn Hill.

TEN GUINEAS *were this Session voted to Mr.* M. LEVIEN, *Pleasant-Row, Pentonville, for his Improvements on the Harp-Guitar, which enable the Performer to play in all the various Keys with Ease, Effect, and Facility. The following Communication was received from him, an explanatory Engraving is annexed, and the Instrument preserved in the Society's Repository.*

SIR,

I BEG leave to lay before the Society of Arts, &c. an improved harp-guitar, the tone of which is similar to the harp, and on a construction which enables the performer to accompany the voice with greater effect, and execute in all the various keys with as much ease as in the general key of C; which prevents the necessity of transposition, and renders facility of performance upon it, much sooner acquired, than on any other guitar, lute, or lyre.

As it may be necessary to give some explanation respecting the improvement of the above instrument, I beg leave to state the nature of, and the mode of execution on the harp-guitar now in use. They are made some with six, and some with seven strings, and are tuned in C; the music for them is never written but in three different keys, namely, the key of C, which is the most general, having neither flat nor sharp. The key of F, which has one flat, and the key of G, with one sharp; all other keys are so extremely difficult, requiring so much labour and cross-fingering that they are never attempted even by a master.

It frequently happens, that ladies meet with songs, &c. which

which they wish to play upon the guitar, but being written probably for the piano-forte, and in some difficult key they are deprived of that pleasure unless they are transposed into one of the above familiar keys, which must take up time, is troublesome, and the rule of transposition perhaps not understood.

I have, therefore, invented brass-stops, which being fixed upon the first fret, obviate all the difficulties abovementioned; for, by turning the stops agreeably to the key intended to be played in, the performer will be enabled to execute with as much facility as in the general key of C.

The turning these stops at pleasure for the different keys is also so simple, that any lady who plays the guitar on the common principle, may be taught the improvement upon my instrument in one lesson.

I beg leave to observe, that this is an improvement long wished for, and I feel anxious to give it publicity; and shall, therefore, consider myself highly honoured, and very much obliged by the Society's inspection and decision upon it.

I am, Sir,

Your most obedient, humble servant,

M. LEVIEN.

No 8, *Pleasant-Row, Pentonville,*
March 29, 1814.

To C. TAYLOR, M. D. SEC.

Certificates.

Dear Sir,

I have maturely deliberated upon your explanation respecting the difference between the *old French guitar*, and your instrument called a harp-guitar. The improvements in the latter are so obvious, that I feel no hesitation in congratulating the admirers of that instrument upon the advantages which it possesses of playing in eight different keys, where the original played but in three, and also producing more notes, with less stopping or fingering than any guitar heretofore produced. I have no doubt but that the instrument, in its present improved state, needs nothing more than publicity to bring it into general use, as it far surpasses all others in point of compass, facility of performance, &c.; and that it may answer your most sanguine expectations, in point of success, is the sincere wish of,

Dear Sir,

Your's truly,

JOHN WHITAKER.

St. Paul's Church-Yard,
April 20, 1814.

To M. Levien, &c.

*** Mr. Flight, organ-builder, and Messrs. Wheatstones, who attended the Committee of mechanics, concurred in opinion, that this is a new and decided improvement of the instrument.

Reference

Reference to the Engravings of Mr. M. LEVIEN'S *improved Harp-Guitar, Plate* 9, *Figs.* 3, 4, 5, 6, *and* 7.

This improvement consists in an appendage to the finger board, by which, any of the strings can be raised or lowered half a tone, so as to introduce such flats or sharps as are necessary, in order to perform such music as is ordinarily met with, without the necessity of previously transposing it into the keys of C, G, or F, as is the case with guitars in general.

This is effected, by placing across the first fret of the finger-board a series of metal loops or stops, through which the strings pass, the holes in the loops being widened so as to permit the strings to vibrate therein unimpeded. These loops being screwed into the finger board can be turned so as to compress the string on each side in the manner frequently done on pedal harps, and thereby to raise the tone of the string half a note higher, thus introducing those sharps, &c. which are necessary to the performance of the music, without the necessity of cross-fingering, the only method of producing them hitherto used, and the great difficulty of doing which is sufficiently known.

Fig. 3, represents the head of the improved guitar, and part of the finger-board; *a, a,* the nut, and *b, b,* the metal loops arranged across, or in place of the first fret; fig. 4, is a side view of these parts; fig. 5, is an enlarged view of that part of the finger-board containing the first fret, with the loops screwed into it of their full size; one of the loops, *a, a,* is here represented as being turned, and acting upon the string so as to raise its tone half a note higher;

and

and fig. 6 shews one of the loops, with its screwed tail or stem and its hole widened as described above, but which more evidently appears in the section of the hole, fig. 7, the opposite sides of it being rounded off, so as not to gall or injure the gut or silk string, by pressing against it, when turned.

The loops are turned by means of a slit made across the handle of the key, used in turning the pins to put the guitar into tune.

The GOLD ISIS MEDAL *was this Session voted to Mr.* P. NICHOLSON, *of Oxford Street, for a new and correct Method of squaring a Hand Rail round the Winders of a Stair Case, so as to be got out of the thinnest Plank possible, and to cut it out to the greatest Advantage, in order to match the Grain of the Wood. The following Communications were received from him, explanatory Engravings are annexed, and Models and Drawings are placed in the Society's Repository.*

SIR,

I BEG leave to lay before the Society of Arts, &c. an invention of mine, which will be found simple in its principle, and important in its application. It consists in a new and correct method of squaring hand-rails round the winders of stair-cases, and depends upon the section of a cylinder cut through any three given points on its surface.

By the application of this principle, the quantity of stuff used in the construction of hand-rails, may be very considerably reduced. It will not only enable the work-

man to cut out the plank in the most advantageous manner for matching the grain of the wood, but will likewise allow of his using the thinnest stuff possible. It is also useful in all works where both plan and elevation are circular, particularly where a cylindric wall is excavated by cylindric openings, and in the construction of archivaults for finishing such windows. Its universality is such, that it may be applied to the angular ribs of cylindro-cylindric groins (such as those in the entry to Somerset House) to spherical niches in circular walls, and to all groins that are circular upon the plan.

Its advantages are incalculable in all works of double curvature, owing to the great facility with which the principle is applied, and the immense saving of time, as well as material attending its application. It entirely supersedes the use of the centre or cylinder, which has hitherto been used to fit the work upon by way of trial, and will enable the mechanic to bring the work to its form in much less time than he has usually employed in preparing the centre.

The use of this principle is not confined to wood-work, but may be employed in all kinds of masonry where works of double curvature occur.

To enumerate the particular advantages of this discovery, would oblige me to trespass too long on your time, which I do not conceive necessary, as the inspection of the models will render these advantages sufficiently apparent.

I am, Sir,

Your obedient humble Servant,

PETER NICHOLSON.

No. 404, Oxford Street, Nov. 15th, 1813.

To C. Taylor, M. D. Sec.

Society for the Encouragement of Arts, &c.

Hand-

HAND-RAILING *is the Art of forming Hand-rails by Moulds, according to Geometrical Rules.*

The principles upon which this art depend, are, that of cutting a right prism through any three given points in space, and that of forming a developement of any portion of the surface of the prism.

In order to illustrate this, let the interior surface of the surrounding wall be that of an entire cylinder, and let the breadth of the steps be divided into the frustums of equal and similar sectors, and let the heights be all equal, as is universally the case; then, if an interior cylindric surface be erected concentric with the wall, and the ends of the steps or surfaces on which we tread, and the planes of the risers tending to the axis, be supposed to meet the interior cylindric surface, it is evident that if the portion of the intercepted surface contained between the indented line formed by the ends of the steps, and the circumferent line at the base be developed or stretched out, all the points of the indented line formed by the outward or salient angles, will be in the same straight line, and all the points formed by the inward or re-entrant angles will be in another straight line. It is also evident, that this will not only be the case with cylinders, but with cylindroids, and every other description of prisms; that is, the points of the developement of the indented line will always have such a position, that two straight lines parallel to each other, may be drawn through the whole number of points.

The points of concourse of the salient angles, are called the nosings of the steps.

The line drawn through all the nosings of the steps, is called the line of the nosings.

Now let the portion of the cylinder before uncovered, be again enveloped, the developement in this state becomes an envelope, and the line of nosings becomes an uniform helix, which would be the form of the rail for such a stair.

In this case, it would be easy to execute the rail to any length we please, in equal portions succeeding each other; for, as the curvature of the helical line is every where the same, the same moulds which are used in the formation of one piece, would serve for every succeeding piece.

The steps placed around the circular part are termed winders; in these the risers tend to the axis of the cylinder.

Steps which have their treads the same breadth, are termed flyers; in these the risers are all parallel.

Very few stair-cases are however entirely circular, but those of the semicircular form with winders in the semicircle, and flyers below and above, are very numerous; in such the line of nosings would be crooked, and would form an angle at the junction of the flyers and the winders, and that round the semicircle would be an helix, consisting of half a revolution.

In the developement of the steps, the line of nosings would consist of three straight lines, the two straight lines through the nosings of the flyers, would be parallel to each other, and each extremity of the middle one would join one extremity of each of the other two; the angles are commonly taken away by introducing a curve in their places.

A hand-rail, however, is not a mere helical line, but a solid, which may be contained between two concentric cylindric surfaces, or concentric prismatic surfaces. The principles are the same, whatever be the form of the plan. A solid erected upon any plan, is called a prism; a cylinder is therefore a round prism, and a cylindroid an elliptic

prism.

prism. A hand-rail may stand upon a circular base, or partly circular and partly straight, or upon an entire elliptic base. In the construction of hand-rails, all prisms are excluded which consist of plain surfaces, or which is the same thing, where the sides of the plan consist entirely of straight lines, as in such cases, the rails themselves are either straight, or partly curved and partly straight upon the top and lower sides only, the sides being in vertical planes.

I shall therefore confine myself to prisms that stand upon a circular base, or upon an elliptic base, or upon a base that is partly circular and partly straight, or, lastly, upon a base that is partly elliptical and partly straight. These two last may be said to have compounded bases or plans, and the former two simple bases or plans; I shall call such a prism a curved prism.

The plan of any curved prism is understood to be of the same breadth, and consequently the solid erected thereon will be every where of the same thickness. The prism may therefore be a hollow cylinder, or a hollow cylindroid, or a concave body partly cylindric and partly straight; the latter may be open on one side, and may have the four planes which join the curved surfaces parallel to each other, and tangent to each of the cylindric surfaces.

Let us therefore suppose such a prism as that last mentioned, and let us suppose it to be cut entirely through its vertical surfaces, in such a manner that any point in the surface of division may coincide with a straight line every where perpendicular to the external prismatic surface, then, every such line will be parallel to the plane of its base, and those lines in the cylindrical part of the prism will tend to the axis. Now it is evident, that the cut or dividing

surface will not be a plane, but will wind or twist between the cylindric surfaces. It is also evident, that the cut may pass through a line drawn in any manner we please, in one of the prismatic surfaces; or, that the developement of this line may have any degree of curvature in the whole length, or in any portion of the length, or may even be a straight line. One of those being supposed to be the case, let the upper part of the prism be taken away, then the upper surface of its remaining part will be brought to view; let a line be drawn on the exterior surface, parallel to the arris, and another on the concave side, parallel to its arris; and let another cut or dividing surface be made to pass through the two lines thus drawn; and let the upper part be removed by this division, then the part thus removed will form a solid helix or kind of half screw which may be either uniform in its upper and lower surfaces, or have any degree of curvature in any part that may be required, according to the developement before mentioned. This is the form of the rail for such a stair, but to form the solid helix, without cutting it from a hollow curved prism, is the thing required to be done in hand-railing.

Now, seeing that two of its sides are actually cylindrical and would be vertical if placed in position; and that the other two winding surfaces may be formed to any developement we please; let us therefore take any determinate portion of the helical solid as a quarter of a revolution, or perhaps something more, as occasion may require, and I shall endeavour to form such a portion or wreath out of a thin plank, instead of cutting it from a solid curved prism. Before this can be done, it is necessary to understand the principle of cutting a prism through any three fixed

points

points in space, by a plane passing through these points; the points may be in the surface of the prism itself, and may be either all in the concave side, or all in the convex side; or partly in the concave side, and partly in the convex side;—That such a supposition is possible will readily appear, since any three points are always in the same plane; and, therefore, the plane may cut the prism through any three given points.

The three points through which the section is cut, are said to be given when the seats are given on the plane of the base of the prism, which plane is understood to be at right angles to the axis of the prism, and when the distances or heights from the seats to the points themselves, are given.

It is always to be understood, that the three seats are not in a straight line, and consequently the three points themselves not in a straight line.

The seat of a point in space on any plane, is that point in the plane, where a perpendicular drawn through the point in space, cuts the plane.

This being established, I shall now show the best means of applying these principles to hand-railing.

In the helical solid, the winding surface connecting the two prismatic surfaces, was defined to be of such a property, as to coincide with a straight line perpendicular to the exterior prismatic surface, and, consequently, if the axis of the curved prism be perpendicular to the horizon, every such line will be parallel to the base; now, let the seats of three such lines be given on the plan, viz. let each extreme boundary be one, and let another be taken in the convex side passing through the point, which would give the middle of the developement of the said side of the

plan; the three seats would be terminated by the convex and concave sides of the plan, and will always be perpendicular to the convex side, and equal in length to each other. Let us call the three level lines, of which their seats are given, the lines of support; let a plane be laid on the three lines of support, the plane will either rest upon three points, or upon one of the said lines and two points; it is evident, that the points which come in contact with the plane, will be at one extremity of each line of support; let each of these points which come in contact with the plane thus posited, be called a resting point. The three resting points are the three points in space, through which the plane is supposed to pass, that cuts the curved prism.

Now, because that each line of support has two extremities, there will be six extreme points in all, but as only three can be resting points, unless the plane coincides with one of the lines of support, it will be proper to shew, which three of the six are the resting points. Let the plane, thus laid upon some three extremities of the lines of support, be continued to intersect the base of the curved prism, then the nearest extremity of the seat of any line of support to the intersecting line, is the seat of the resting point of that line.

For this purpose, let a developement of the convex side of the rail be made according to the plan and rise of the steps. The part of this developement that is made to bend round the convex or concave cylindric surface of the helical portion or wreath, is called a falling mould, which is supposed to be brought to an equal breadth throughout its length. Only one falling mould is used in the construction of hand-rails. Let, therefore, the falling mould for the convex side be constructed, and let two straight lines

lines be drawn from the ends of the upper edge of that part of the falling mould corresponding to the ends of the wreath, perpendicular to the base of the whole developement; also, let another intermediate line be drawn parallel to the other two, so as to bisect the part of the base intercepted by the said two parallels: the three parallels will thus give the heights of the three resting points, the shortest height is at one extreme, and the longest at the other. Suppose now, the shortest of these three heights taken from each of the three, and the remainders taken as heights, instead of the whole, then the height of the first resting point will be nothing, and will therefore coincide with its seat; then, if the middle height be less than half the length of the remaining height, the seats of the resting points will be the first and second extremities of the first and second lines of support taken on the convex side, and the extremity of the third on the concave side. The first resting point is a point in the intersection of the plane of the base, with the inclined plane.

The process is now completely reduced to that of finding the section of a prism through three given points, which suppose to be done, and the plane of section will touch the supposed wreath, at the resting points of each line of support, without cutting the wreath at any such line—then, the three lines of support will be on the same side of the plane, viz. on the under side. Let us suppose now, another section taken below, and parallel to the former, so that the wreath may be just contained between these parallel sections, or planes; the distance between the two sections, will represent the thickness of the plank.

The section of the prism through its vertical surfaces, is called the rake, or the rake of the plan; and a mould being cut to the rake, is called the face-mould.

The

The above are the general Principles; the Particulars will be best understood by the Explanations which accompany the following Diagrams, referring to Plates 10 *and* 11.

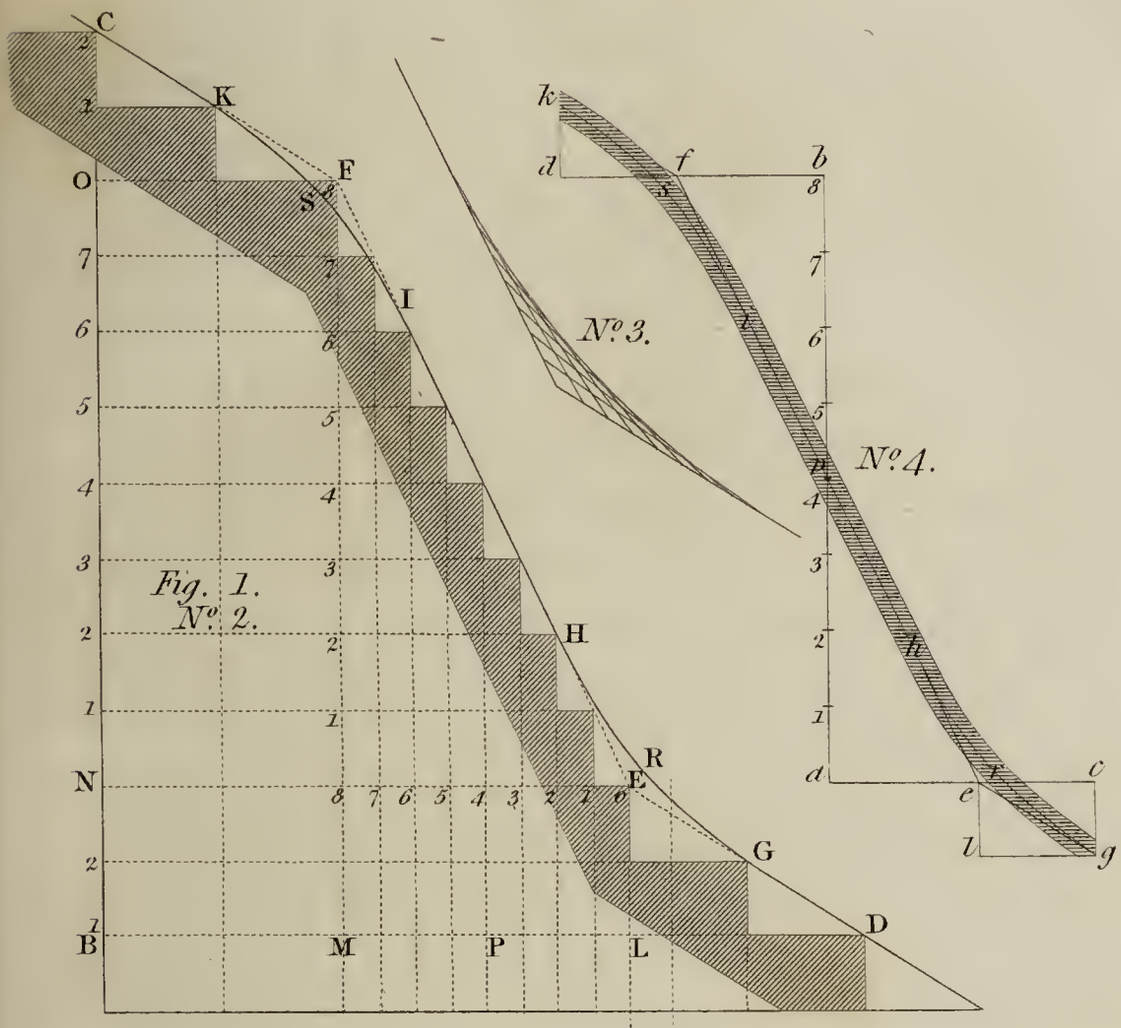
Let fig. 1, No. I, plate 10, be the plan of a geometrical stair, with eight winders in the semicircle, and flyers above and below; the first or lower steps being denoted by the scroll *a*; let *q l p m r* be the plan of the part of the rail that is to be formed in two wreaths; and *q l* and *m r* straight parts; in order for the better securing of the wreaths, to the straight parts opposite the flyers.

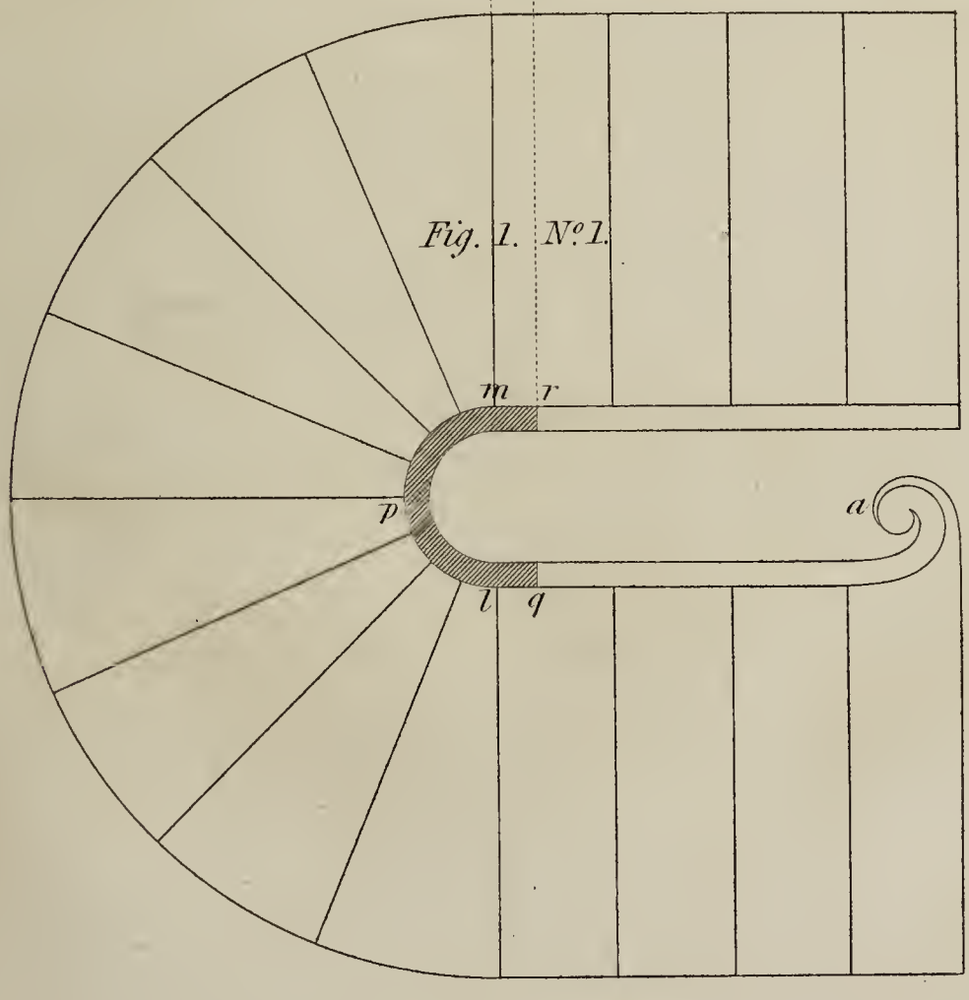
Let fig. 1, No. 2, be the developement of twelve steps, including that of eight winders, two flyers below and two above; D B being the base, and B C the height. In the base D B, No. 2, L P M, is the developement of *l p m*, No. 1. and L D, M B, the breadths of two steps corresponding to the plan. In the height B C, N O, is the height of the winders, and N B, O C each the height of two steps answering to the flyers at each end. D E F C is the line of nosings; the parts D E, F C of the flyers being parallel to each other, and joined by the part E F the developement of the winders; G R H, and I S K are curves tanged by the straight lines E D, E F, and F E, F C, at the points G, H, I, K, or rounded off, as shewn at No. 3, on a longer scale, so as to form an agreeable curved line without angles.

The line G R H I S K may be called the line of the rail, being of the same form as the line bissecting the breadth of the developement of the rail, for the one may

be

Mr. P. Nicholson's Method of Squaring Hand Rails.





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be supposed to be every where of the same height from that of the other; and therefore, the line G R H I S K, may be conceived to be the developement of the rail.

No. 3 shows the manner of drawing the tanged curves G R H, and I S K; No. 2 the upper one I S K, being the same as the lower one G R H, but inverted.

No. 2 shows more lines than are wanted in practice, in order to shew the connection between the developement of the steps, and the developement of the line of the rail. But, as the developement of the line of the rail is all that is wanted, make *a b*, No. 4, equal to the height of the winders, draw *a c* and *b d*, at right angles each with *a b*; make *a e* and *b f* each equal to the developement of *l p* or *p m*, No. 1; make *e c*, and *f d*, the breadth of a step; draw *c g* and *d k* parallel to *a b*; make *c g* and *d k* each equal to the height of a step; join *e g*, *f k*, and *e f*; make *e h*, equal to *e g*, and *f i* equal to *f k*, and draw the tanged curves *g r h* and *i s k* as before; then *g r h i s k* will be the line of the rail, as in No. 2; for *e f* will be obtained, equal to E F, No. 2; and *e l g* will be the section of a flyer at the lower end, and *f d k* the section of a flyer at the upper end. The breadth of the falling mould, in common cases, is about two inches, therefore, two lines being drawn parallel to the line of the rail, each at an inch distance from it, gives the complete falling mould for both wreaths. The two parts of the falling mould as divided by *a b*, are equal and similar to each other, and would therefore coincide if applied together.

Let fig. 1, No. 1, plate 11, be an enlarged plan of the rail, of double dimensions to No. 1, plate 10, in order that the moulds may be more exactly obtained, and the construc-

tion

tion more clearly seen. Let A B C D E F G, fig. 1, No. 3 be the plan of the part of the wreath to be formed, A G being the seat of the line of support at the lowest part, and D E that at the highest part; then A is the seat of the resting point at the lowest end, and E that at the highest end. Take the point C, between A and D, so that C, in the developement of the line A B C D, may divide the said developement into two equal parts.

Let A B C D, No. 2, be the developement of the curve A B C D, No. 3.; the parts A B, B C, C D, being the respective developements of A B, B C, C D, No. 3. In No. 2, draw D K perpendicular to D B; and make D K equal to the height of eight steps; draw K S parallel and equal to D B; join B S; produce K S to T, and D B to V; make S T and B V each equal to the breadth of a step; draw T U and V W parallel to D K; make T U and V W equal to the height of a step; join W B, B S, S U; then W B S U is the line of nosings. The whole is completed as in No. 3, plate 10. Draw A X parallel to K D, cutting the upper side of the falling mould at X; draw X Z parallel to A D; produce K D to Z, and let K D cut the top of the rail at I; through C draw Y J, parallel to D K, cutting the top of the rail at J, and X Z at Y; then Y J and Z I, respectively, are the height of the resting points, whose seats are C and E, No. 3. In No. 2, draw J R parallel to B D, cutting D K at R. In No. 3, join the seats E and C, of the resting points, and produce E C to L. In J R, No. 2, find the point O, by making R O equal to E C, No. 3; join I O, and produce I O to meet X Z at Q. In No. 3, make E L equal to Z Q, No. 2., and join A L; through G draw H K, perpendicular to A L, and produce L A to H; through E

draw

draw E*i* parallel to L H, cutting H K at I; make I*i* equal to Z I, No. 2, and join H*i*, and produce H*i* to K. To find any point in the curve of the section, take any point M in the boundary of the plan, and draw M*p* parallel to E*i*, cutting H*i* at *p* and H I at P; draw *pm* at right angles to H*i*, and make *pm* equal to P M, and *m* is a point in the boundary of the rake. In like manner, let M P cut the concave side of the plan at N; in *pm* take *pn* equal to P N, and *n* is a point in the concave side. A sufficient number of points being thus found, draw a mixed line, *abcdefg*, through the whole, and *abcdefg* is the figure of the rake. For greater accuracy and dispatch, it will be necessary to find a point in the rake corresponding to the extremity of every straight line in the plan, as shewn by small letters of the same names as the capitals on the plan. The part A B F G being a parallelogram on the plan; the corresponding part *abfg*, on the section, is also a parallelogram; in this case it will be only necessary to find the points *a*, *g*, *f*. Join *ag* and *gf*; draw *ab* parallel to *gf*, and *fb* parallel to *ga*, and the point *b* gives the commencement of the convex curve *bcd*, and the point *f* that of the concave curve. It remains to be shewn that H L, No. 3, is the intersection of the plane on which the section of the prism is formed; for the point A is not only the seat of the lowest resting point, but the resting point itself. A is therefore the point in the intersection of the cutting plane. In No. 2, draw *o* Δ parallel to K Z, cutting B Z at Δ; conceive the triangle I Q Z to be removed to No. 3, so that the point Z may be upon E; and because R O Δ Z is a parallelogram, Δ Z is equal to R O, and R O is equal to E C by construction; therefore the point Δ will fall upon C;

and,

and, by construction, the point Q will fall upon L. Conceive the triangle, with its base, thus coincident with LE, to be raised perpendicularly to the plan; I will be the resting point over E, and O the resting point over C; therefore the points I and E will be in the plane of section, and consequently be the straight line IOQ; but the point Q, now supposed to be coincident with L, is common to the plane of the base; and the plane of section, Q is therefore a point in the intersection of the cutting plane and the base. The point A has likewise been shewn to be a point in the intersection; therefore the straight line H L, passing through the points A and L, is the intersection of the cutting plane, with the plane of the base. The point L, No. 3, will be obtained also by a fourth proportional to IR, IZ, RO, or Z Δ, No. 1, setting it from E to L.

A mould being cut to the form of the section, as here obtained, is called by workmen, the *face mould*, which I shall suppose now to be made.

To find the Thickness of the Plank, out of which the Wreath is to be cut.

Let Z I, No. 2, cut the under edge of the falling mould, at ε, transfer Z E upon K *k*, No. 3, from K to ∂; then the nearest distance between the point ∂ and the straight line H *k*, is the thickness of the stuff at the upper joint.

The wreath, when formed into two prismatic surfaces, and into two winding surfaces, is said to be squared. This formation is all that is required from geometrical principles.

principles. Then, supposing the wreath set in its proper position, every section made by a vertical plane, perpendicular to the convex side of the plan, will be a quadrilateral with its two vertical sides parallel, and at right angles to the upper side, and at oblique angles to the lower side. This arises from the top being so formed as to coincide in every part with the line perpendicular to the prismatic surface as defined, and the lower winding surface by gauging upon each cylindrical surface from the top.

To draw the Rake on the Sides of the Plank, in order to Plumb the two Sides of the Wreath.

Let A B C D, fig. 2, No. 1, be a developement of three sides of plank; let A E, H D, be the top E F, G H, the edge in breadth equal to the thickness of the stuff obtained from No. 3, and F B, C G, the undersides; let the lines E H and F G, be parallel to *k* H, No. 3, in order to be more easily comprehended (as otherwise, it is not necessary), let *a b c d e f*, on the top of the plank, be the rake formed by the face-mould, the point g being in the line H E, and the line *g e*, making the same angle with *g* E as the line *g e*, fig. 1, No. 3, makes with *g k*, draw g K, making the angle H *g* K equal to the angle H *k* K, or H *i* I, or H *p* P, fig. 1, No. 3, cutting the arris, fig. 2, No. 1, G F, at K, then the same mould being drawn on the under side, with the point *g* at K, and the chord *e g* making the same angle with K F, that *e g*, on the upper side, makes with *g* E, or the distance of the point *e* from G F

G F, on the lower side, equal to the distance of the point *e* from H E, on the upper side. Let us now suppose lines drawn in the above manner upon the three corresponding surfaces of the plank to that of the figure, and let the plank be cut out with a bow saw. In the act of cutting, the kerf must be kept close to the corresponding lines of each rake, and the line of the teeth of the saw parallel to g K, and when the piece of the wreath is entirely divested of the superfluous wood, the sides thus formed will be plumbed.

To draw the Rake upon the Plank in every Position to the adjoining Arris of the Edge.

Let fig. 2, No. 2, be a developement of the plank as before, the same letters referring to the same parts. Let *a b c d e f g* be the rake drawn by the face mould, the point *g* being in the arris H E, and the chord *g e* forming any given angle with the arris H E, less than that formed in No. 1', fig. 2 by the chord *g e*, and the arris H E; find *g* as before from No. 3. In No. 3, draw g l, making the same angle with the pitch line *g k*, as *g e* makes with *g* E, in fig. 2, No. 2; draw g L perpendicular to H E, cutting the lower arris G F in L; make the angle K L *g* equal to the angle *e g* I, fig. 1, No. 3; make L *g* equal to L K, through *g* draw M N, parallel to G F; then, drawing the rake upon the lower side by the edge of the mould, so that the angle *e g* N, on the said lower side, may be equal to the corresponding angle *e g* E on the upper side; the two sides of the piece that is to form the wreath, may be plumbed

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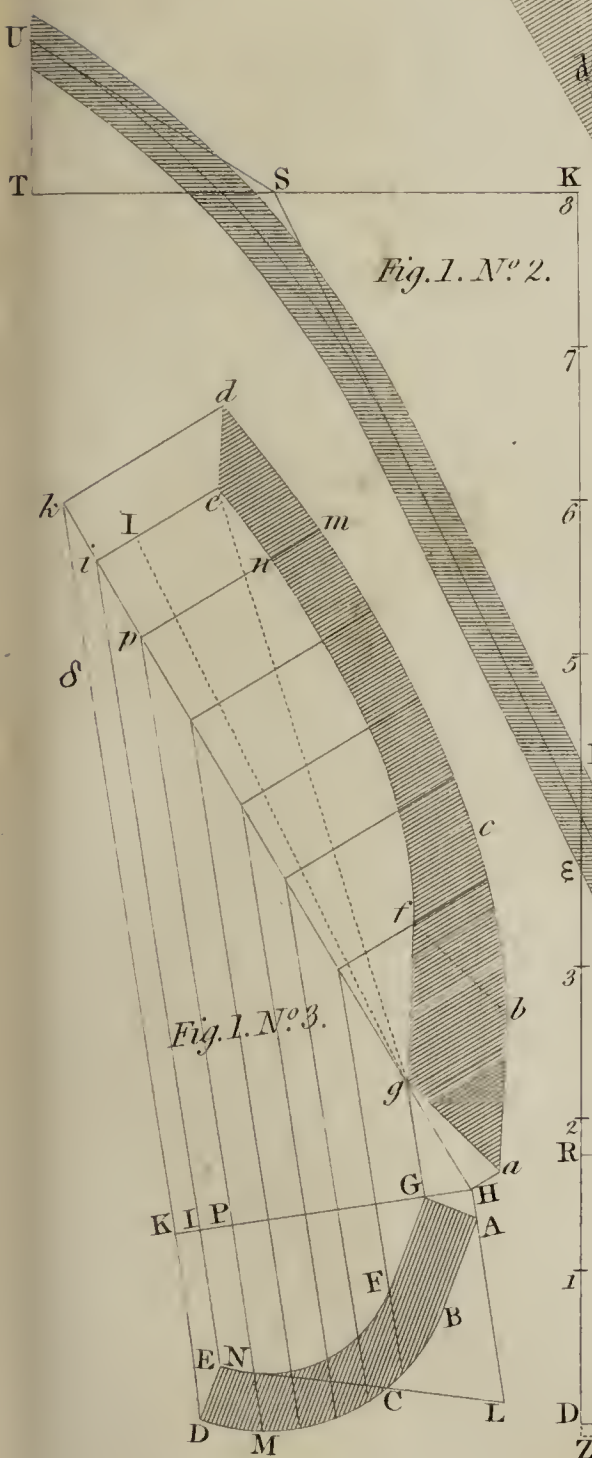


Fig. 1. N°. 2.

Fig. 1. N°. 3.

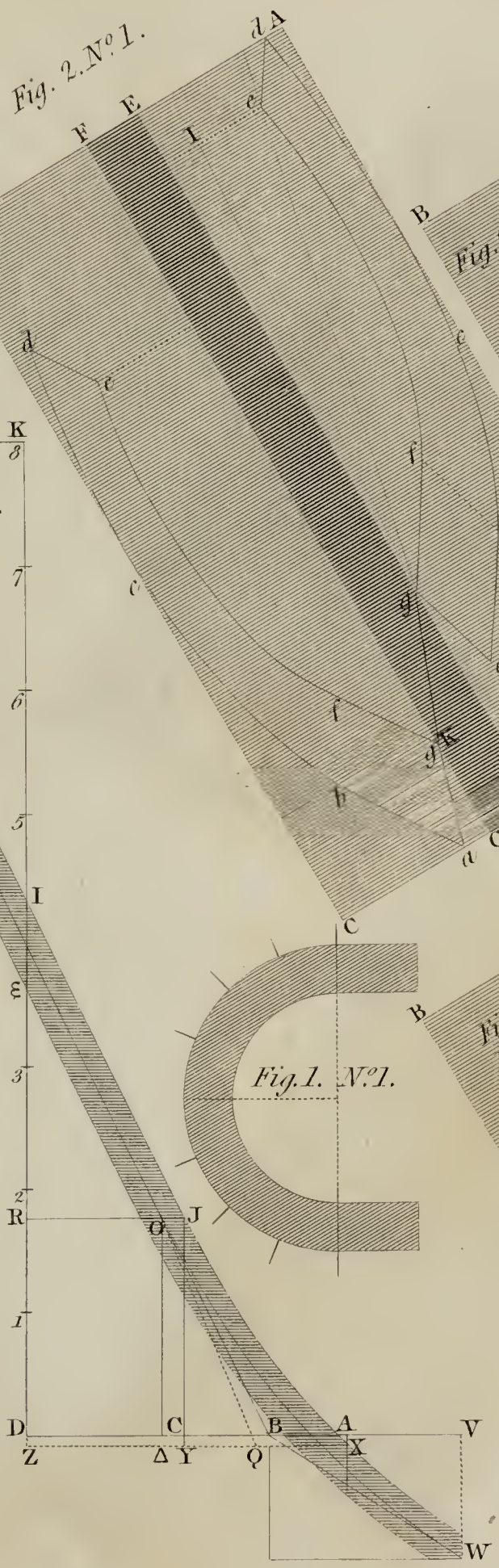


Fig. 1. N°. 1.

Fig. 2. N°. 3.

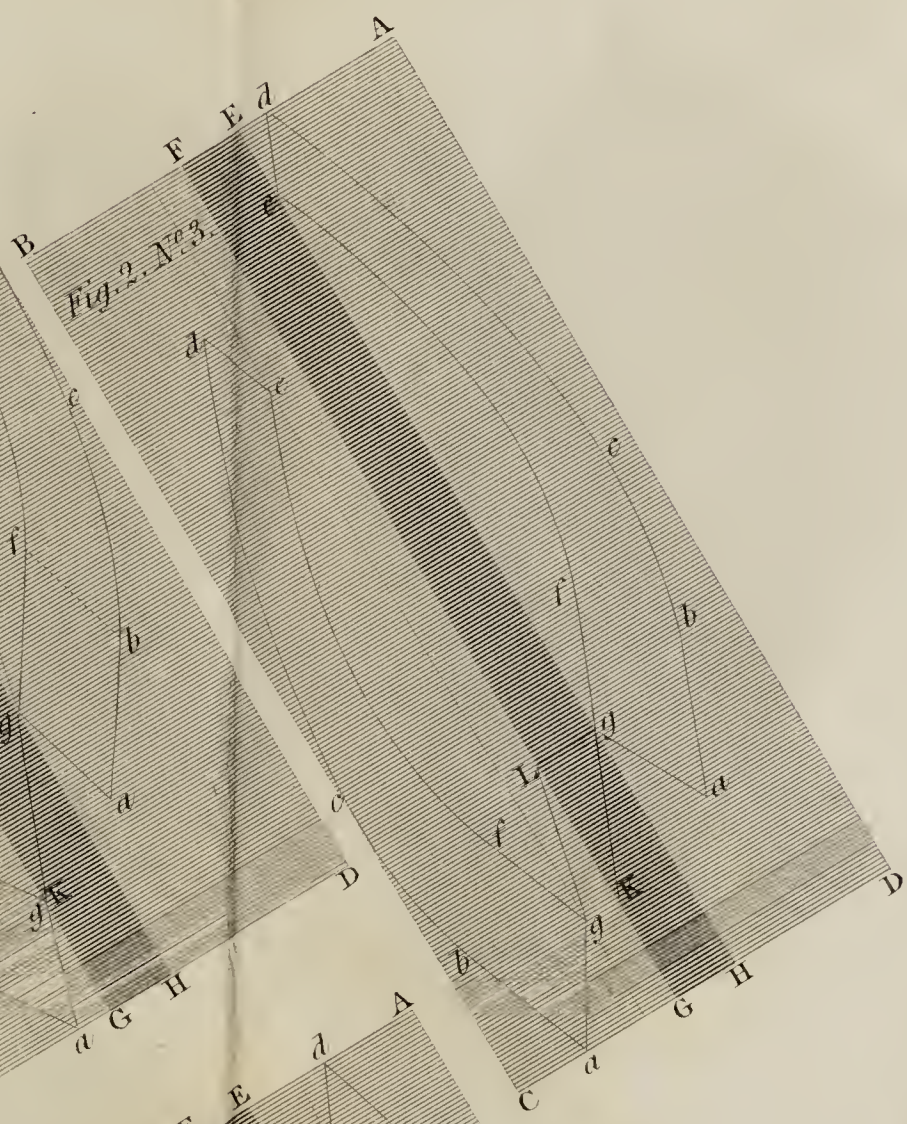
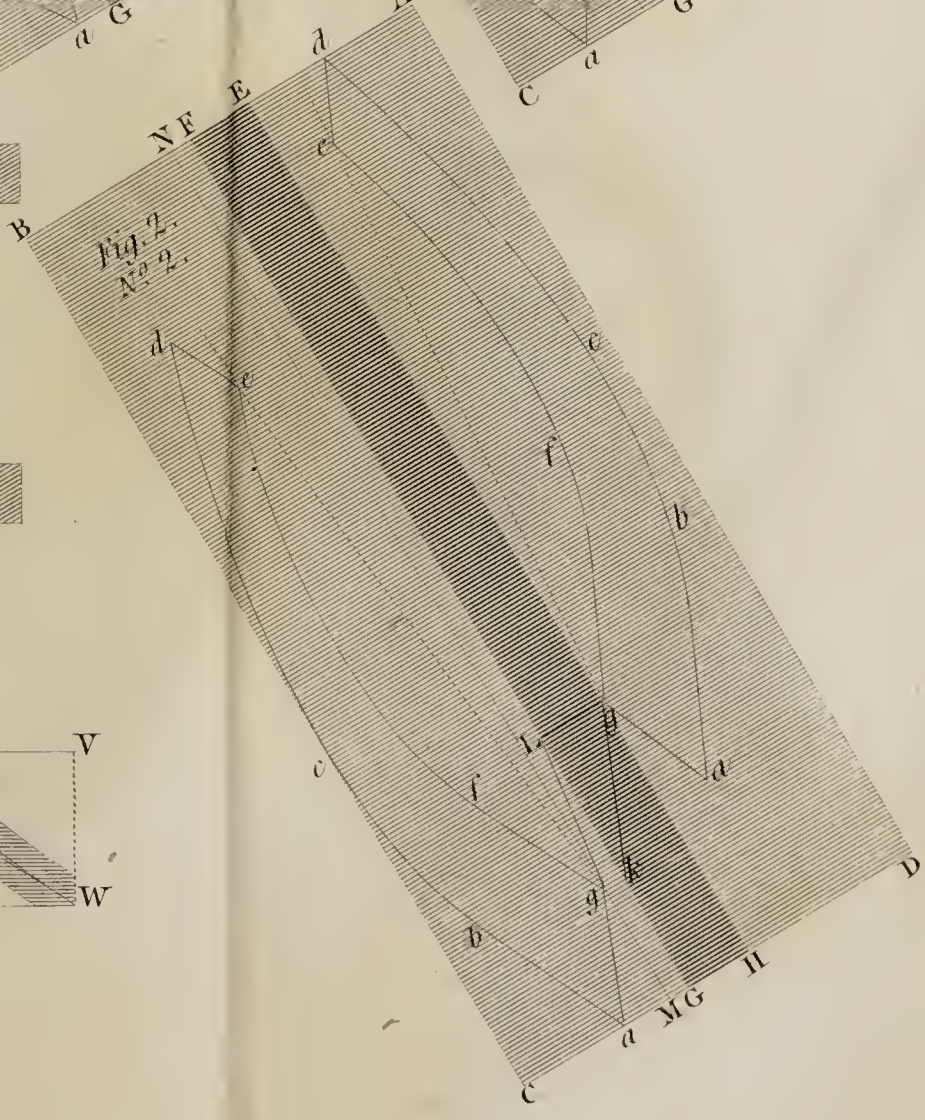


Fig. 2. N°. 2.



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plumbed as before, so as to correspond with the plan when set to its position.

If it is required to draw the rake with each extremity of the concave side of the mould in the arris of the plank as in fig. 2, No. 3, it is only making the angle K L g equal to the angle *e g k*, fig. 1, No. 3, the rest is drawn, and the plumb side is formed in the same manner as No. 1 and No. 2, fig. 2, which suppose to be done, bend the corresponding part of the falling mould, fig. 1, No. 2, round the convex side of the piece for the wreath; bring the points X and J to the plane at the top, and draw the line of support at the upper extremity upon the end of the wreath; now, bring the upper end of the falling mould close to the extremity of the line of support, and draw a line by the upper edge of the falling mould; cut away the superfluous wood in the manner before described, and this will form the back or top of the rail, then guage the two vertical surfaces to the same breadth, and cut the superfluous wood away from the under side; this portion of the rail will then be squared. The wreath for the other portion above, is identically of the same form, therefore, if two pieces are prepared by the same moulds and levels, then supposing one of these wreathed pieces to be set in its position for the lower part, and let the upper part be set in the same position, and then inverted, so that the top and bottom ends, and the upper and lower winding surfaces will have changed places, but each of the vertical surfaces kept still upon the same side; let the lower end of the higher piece be brought to contact with the higher end of the lower piece, that the two planes may coincide and form a joint; the helical solid for half a revolution will be formed out of a straight plank as required to be done.

The two wreathed portions of a hand-rail are not always alike, as in the preceding example, this may happen in different ways, as from one quarter of the semicircular part, being divided into winders, and the other undivided, or, from the rail being placed higher upon the winders, than over the flyers; but in whatever way the variation takes place, the application of the principle is the same, it only requires moulds to be constructed for every such variation, or separate part.

The intricacy of the diagrams constructed upon my former principles, prevented their being generally understood, and very few could practice with success. But the principles here laid down, are so invariable in their result, so simple and expeditious in their application, and so easily to be comprehended, even by a moderate capacity, that they cannot fail of being introduced into general use. They unite the requisite properties of saving labour and stuff, the workmen constructs his moulds with ease, and has less superfluous wood to remove. The edge of the plank is kept square, which entirely supersedes the bevelling, and is even in this point attended with a considerable saving of stuff and time, as it allows sufficient wood at the ends to make the heading joints, and as the piece which is cut out of the rail piece from the hollow side, may be turned into use; but if the edge of the plank were bevelled it would require to be much longer, in order to form the heading joints, and the piece cut out would be too trifling to be employed to any purpose.

In addition to the advantages already enumerated, the workmen will be encouraged by the clearness of the different steps of the process, which cannot fail of fully satisfying his mind as to the final result.

It is likewise a great accommodation, that any rail whatever may be cut out of the same thickness of plank, and that the mould may be applied in any direction which the workman pleases to the surface, in order to save wood or match the fibres at the joint.

The art of forming hand-rails round circular or elliptic well-holes without the use of a cylinder, is entirely new.

PRICE, the author of the "*British Carpenter*," is the first person who seems to have had any idea of this art; the subsequent writers following his schemes, which were very uncertain in their application, have added nothing to the subject, but have even thrown it into greater obscurity.

The first successful method of squaring the wreath or twist, was invented and published by me, in the "*Carpenter's Guide*," in 1792; and certainly was the first wherein the process was subjected to any thing like geometrical principles, from which the result was attended with success. In the "*Carpenter's Guide*," (generally called simply "*The Guide*,") the formation of the face mould was regulated by the falling mould or the developement of the rail, not by the rise and tread of the steps, as shewn by Price and his followers. When the back or upper surface of the rail had a considerable concavity, as in the case of the junction of flyers and winders, the consequence of this regulation in many cases in the formation of the rail was the saving of seven or eight inches in the thickness of stuff; and thus while the method laid down by Price required a plank from six to nine or ten inches in thickness, according to the degree of concavity; that in the Guide seldom required a plank more than three inches thick, excepting in small well-holes of three or four inches diameter.

From the great thickness of stuff to cut through, and

the quantity to be taken away, the time required to form the piece of wood into a wreath by Price's method, must have been at least double to mine in "*the Guide*" and proportionally more so, as the thickness of the plank required by Price, was greater than that in *the Guide*.

But though considerable advantages were thus obtained in the saving of stuff and labour, it must be observed that an elevation of the supposed vertical ends of the twisted piece at each joint, and a vertical section of the said piece were employed to obtain the inclination of the plane of the face of the mould, or that of the faces of the plank; this inclination was only correct when the planes of the faces of the plank were at right angles with the chord plane, or that passing through the chord of the plan of the wreath; but when inclined to the chord plane, required thicker stuff, in proportion to the degree of obliquity, whether more acute or more obtuse.

The method shown in "*The Guide*," was also the first attempt to spring the plank, that is, to make its plane rest upon three parts of the rail; and though the utmost degree of perfection was not attained, it has been of great use to workmen, as all the hand-rails of stairs in and about London, and in most parts of England, have been executed upon its principles for upwards of twenty years.

In order to obtain still greater correctness, I tried another method, by setting up three heights, supposed to be on the surface of a curved prism, in the middle of the rail; but this, though still nearer than that published in "*The Guide*," did not give me entire satisfaction; for the resting points being in the middle of the rail, the plane of section which formed the face mould did not clear all

the

the three sections without cutting into the solid of the wreath.

In the pursuit of truth, I was led to consider what would be the real resting points. It readily appeared, that a level line drawn towards the axis of the well-hole, might be made to coincide in every part with the top of the rail; that if the plane of the top of the plank be supposed to be placed on three vertical sections of the supposed rail in contact with a point in each, or coincident with the whole line of support of one of the sections, and with a point in each of the other two; and the surface of the plank thus inclined be supposed to be prolonged, to intersect the horizontal plane of the base, the intersection would always point out the resting points, and shew their true seats upon the plan. From this consideration, it was evident that the resting point of each section, and consequently each seat, was that extremity of each section next to the intersecting line of the plane of the plank and that of the plan.

This theory being applied to practice, has given the utmost satisfaction, both in the saving of stuff and time; the diagram for the face mould is completely divested of all cross and oblique lines, and is, perhaps, in the most simple form to which it can possibly be reduced; the plane of section comes in contact with the tops of three vertical sections of the rail in every case whatever, and thus every desideratum is obtained by the most simple means.

Therefore, in practice, if we suppose the section of the rail to be two and a quarter inches horizontally in breadth, and two inches in thickness (as is generally the case), a

plank of two and a half inches thick will be sufficient for a rail, with any degree of concavity or convexity on the back.

Sir,

I have herewith sent you the drawing and description of the additional plate for my article upon hand-railing; the plate, I trust, will give just representations of the solids themselves, which, with the explanation, will be satisfactory in forming a perfect idea of the execution of the work.

I am, Sir,
Your most obedient servant,

Peter Nicholson.

Oxford-street, June 1st, 1815.

To C. Taylor, M.D.
Secretary to the Society of Arts, &c.

Reference to Plate 12.

Fig. 1, is a plan of the cylinder, with the elevation of the helical line, which is found by dividing the height into equal parts, and the circumference of the base into equal parts also, then drawing the lines through the points of division, as in the figure.

Fig. 2, a representation of the solid helix twisting round the cylinder, making a continued rail upon a circular plan; the curvature of the solid helix is, therefore, every where the same. The rail is exhibited as squared; and

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Fig. 1.

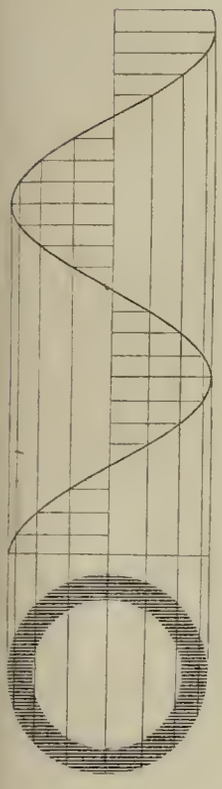


Fig. 2.

Fig. 3.

No. 3. No. 2. No. 1.

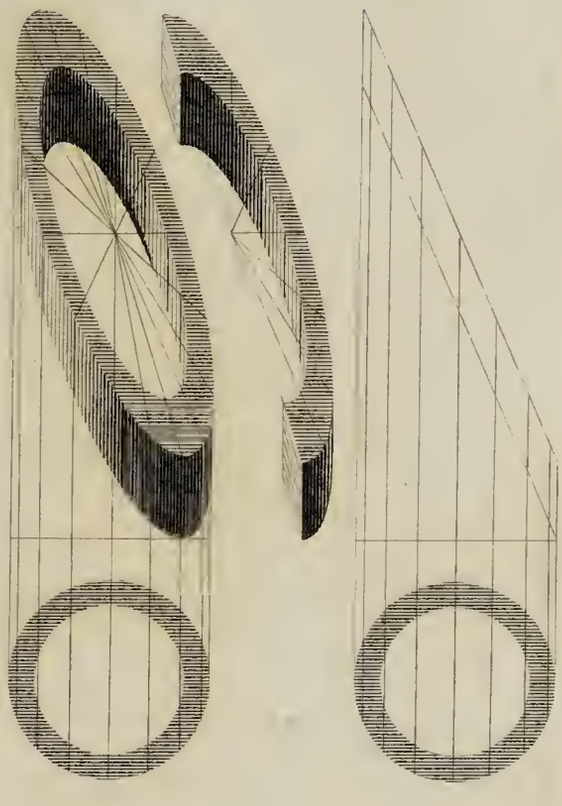
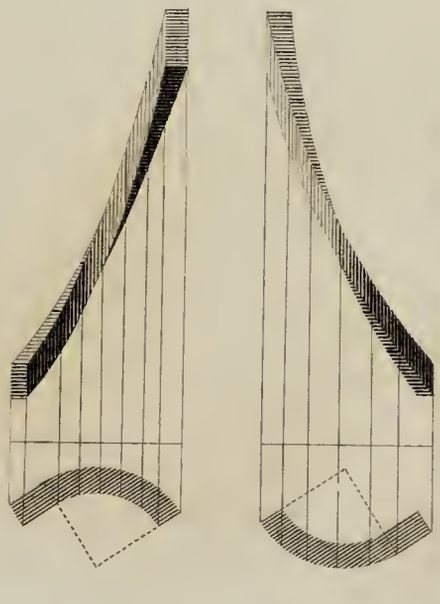


Fig. 4.

No. 1. No. 2.

Fig. 5.

No. 1. No. 2.



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and though it appears as one piece, it must be understood to consist of several wreaths, or lengths, screwed together, each length answering to a quadrantal part of the plan.

Fig. 3, shows the different sections of a hollow cylinder, cut entirely through the curved surface, the solids exhibit a portion of the said cylinder contained between two parallel planes: No. 1. shows the thickness of the section according to the inclination of the cutting plane; No. 2, shows the section of a semicylinder, and No. 3, that of an entire cylinder, cut according to the position of No. 1.; the sections, No. 2. and 3., being turned round, so that the plane of section may be brought into view, in order to make the solid appear.

Figure 4, exhibits a solid section of a hollow cylinder, upon a quadrantal plan, with a small part straight; No. 1. exhibits the convex side, No. 2. the concave side. This figure shows the state of the rail-piece as prepared by the face-mould, and is therefore bounded by two concentric cylindrical surfaces, and two parallel planes. The falling mould being applied upon the convex side, the superfluous wood is cut away according to a line drawn by the upper edge of the falling mould, in such a manner that the stock of the square, being applied upon the convex side, parallel to the axis, the under edge of the blade may coincide with the top or winding surface of the rail-piece. The thickness of the rail is regulated by running the stem of a guage first upon the convex side, with the head upon the top or winding surface, and then the stem upon the concave side in the same manner, and cutting away the superfluous stuff between the two gauge lines.

Fig. 5, exhibits the wreath, or rail-piece, as completely

squared: No. 1. shows the concave side, with the lower end of the back, or upper surface, and the higher end of the lower surface; and No. 2. the convex side of the cylindric surface, with the upper part of the back, and the lower part of the under side.

The rail exhibited in figure 2, is only a succession of wreaths, as in figure 5.

From what has been shown, it will be easy to conceive how a rail may be executed to any given plan, and to any developement of the steps according to that plan.

Though it may be possible to make a rail in one piece, as in figure 3, No. 3, such a rail will hardly ever come into practice; the representations of the solid sections, in Nos. 2 and 3, are therefore not shown with a view of being prepared for a rail, but to give a clear view of the different parts of the solid sections of a hollow cylinder.

PETER NICHOLSON.

The SILVER MEDAL *and* FIVE GUINEAS, *were this Session voted to Mr.* HENRY WARD, *of Blandford, for an Equation Work for a Clock. The following Communication was received from him. An Explanatory Engraving is annexed, and a Model of the Apparatus is preserved in the Society's Repository.*

SIR,

I HAVE often thought that, if some cheap and simple mode of shewing the sun's apparent duirnal motion by a clock

clock could be contrived, it would not be the least useful and convenient improvement in the artificial measure of time. For as the sun's apparent motion is constantly varying from his mean motion, and the difference arising from this variation sometimes amounts to more than a quarter of an hour; and further, if the great perfection to which pendulum clocks are arrived at in the present day, and the extreme accuracy with which they are capable of representing mean solar and sidereal motions, are considered, there seems no sufficient reason why an error of such magnitude should be entirely neglected. Agreeably to this idea, I send, for the inspection of the Society for the Encouragement of Arts, Manufactures, and Commerce, a model of an equation apparatus, which I invented and applied to a regulator that I made about six years ago, and which is found to perform extremely well.

The application of the equation of time, or rather, the sun's apparent diurnal motion to a clock, is by no means a recent discovery. Several clocks of this kind were made nearly a century ago, both in England and in France; but the complexity of their construction, the extreme difficulty of execution, the incapacity of the greater number of workmen, to which may be added the expence, have operated as insurmountable obstacles to the introducing them into general use: so that, for many years past, clocks of this description have been but little in request, and the making of them laid aside, and almost forgotten.

The first clock of this kind that we have any acconut of, was found in the cabinet of Charles the Second, King of Spain, about the year 1700, as may be seen in Sully's *Regle Artificielle du Temps*, edit. 1717. But the author of this curious invention did not then appear to be known.

Mr.

Mr. Williamson, an English artist, however, in the Philosophical Transactions, No. 363, asserts his right to it, and says he is well satisfied that this clock is one which he made for Mr. Quare, who sold it soon after, to go to the said Charles the Second, King of Spain. Mr. Williamson has not given us a description of the mechanism, but merely states that there were two fixed and two moveable circles; the former shewing the hour and minute of mean time, the latter, which were concentric to the former, that of apparent time. In the same paper he also tells us, that shortly afterwards he made other clocks for shewing apparent time, by raising and depressing the pendulum through a slit in a piece of brass, so that its vibrations would agree with the sun's apparent motion throughout the year.

Equation clocks were first made in France, about the year 1717, by M. le Bon and M. le Roy; though a project of this kind, by the Reverend Father Alexandre, was laid before the Academy of Sciences, as early as 1698. The clocks constructed by M. le Bon, scarcely differ from that in the King of Spain's cabinet; they had two concentric circles, one of which was moveable, and its motion was regulated by an equation plate, that performed a revolution in a year. Clocks, and watches too, with moveable circles, have since been made with some improvements, by several French artists; and, as far as simplicity is concerned, are perhaps the best of any that have hitherto been constructed.

A much more elegant mode of shewing mean and apparent time, is by two minute hands; one of which moves concentrically to the other, and has a piece of brass attached to it representing the sun, to distinguish it from that which points out mean time. Some excellent clocks

of

of this sort have been made by GRAHAM; they have likewise been made in France, by LE PAUTE, PASSEMENT, BERTHOUD, &c.; but all of them are so extremely complex, that it is no wonder they have not been more generally in use. These clocks require not only an annual motion, in common with all others of the kind, but there is an addition of several wheels to the minute work, that renders them extremely difficult of execution, and, without great care, liable to considerable sources of error.

The model herewith sent has two minute hands; it has no real annual movement, but only a relative one. By these means, the construction is rendered simple, and the execution easy. It may be made in less than a week by any ordinary workman who comprehends the use of its parts.

I cannot conclude this letter without expressing my regret that we have no complete Treatise on Clock and Watch Work in the English language. It is more to be lamented, because this country stands pre-eminent in the mechanical arts; and the greater number of useful inventions and improvements have been made by English artists. Some excellent works on the subject have been published in France, Germany, and even in Spain. For the honour of our country, as well as for the benefit of the public, let us hope that some geometrician and mechanist will one day favour us with a work on a subject of so much importance—a work certainly much wanted at the present time.

I am, Sir,

Your most obedient servant,

HENRY WARD.

Blandford, March 21, 1814.

To C. TAYLOR, M.D. SEC.

De-

Description of Mr. HENRY WARD'S *Equation Work for a Clock.*

It will be proper first to explain the principle upon which the annual motion is founded; when that is done the rest will be easily understood. It consists of the difference of velocities of two wheels, that turn concentrically to each other; to effect which the following numbers are employed:

111. 79.
137. 64.

If 111 be multiplied by 79 the product will be 8769; and 137 multiplied by 64 gives 8768 the difference being unity. Now if the wheel of 111 teeth be made to revolve in an hour, the end is obtained; for it makes one revolution less in a year than the wheel of 137 teeth. It may be observed, however, that 8768 hours exceed a tropical year by a little more than two hours; but this difference is so extremely small, that in practice it may be altogether neglected, for the error will not become sensible till after several years.

Reference to the Engraving of Mr. H. WARD'S *Equation Work for a Clock.* Plate 13. Fig. 1, 2, and 3.

The mechanism will be best explained by a profile. A, A. Fig. 1 represent a steel arbor, to which is fixed a nut B of 24 teeth; this arbor also carries the apparent time hand 1. C is the minute wheel of 111 teeth, screwed to a brass socket *b*, *c*, which turns on the arbor A A; the end of this socket is the fore pivot to the arbor, is armed with steel,

Mr. H. Ward's Equation Work for a Clock.

Fig. 3.

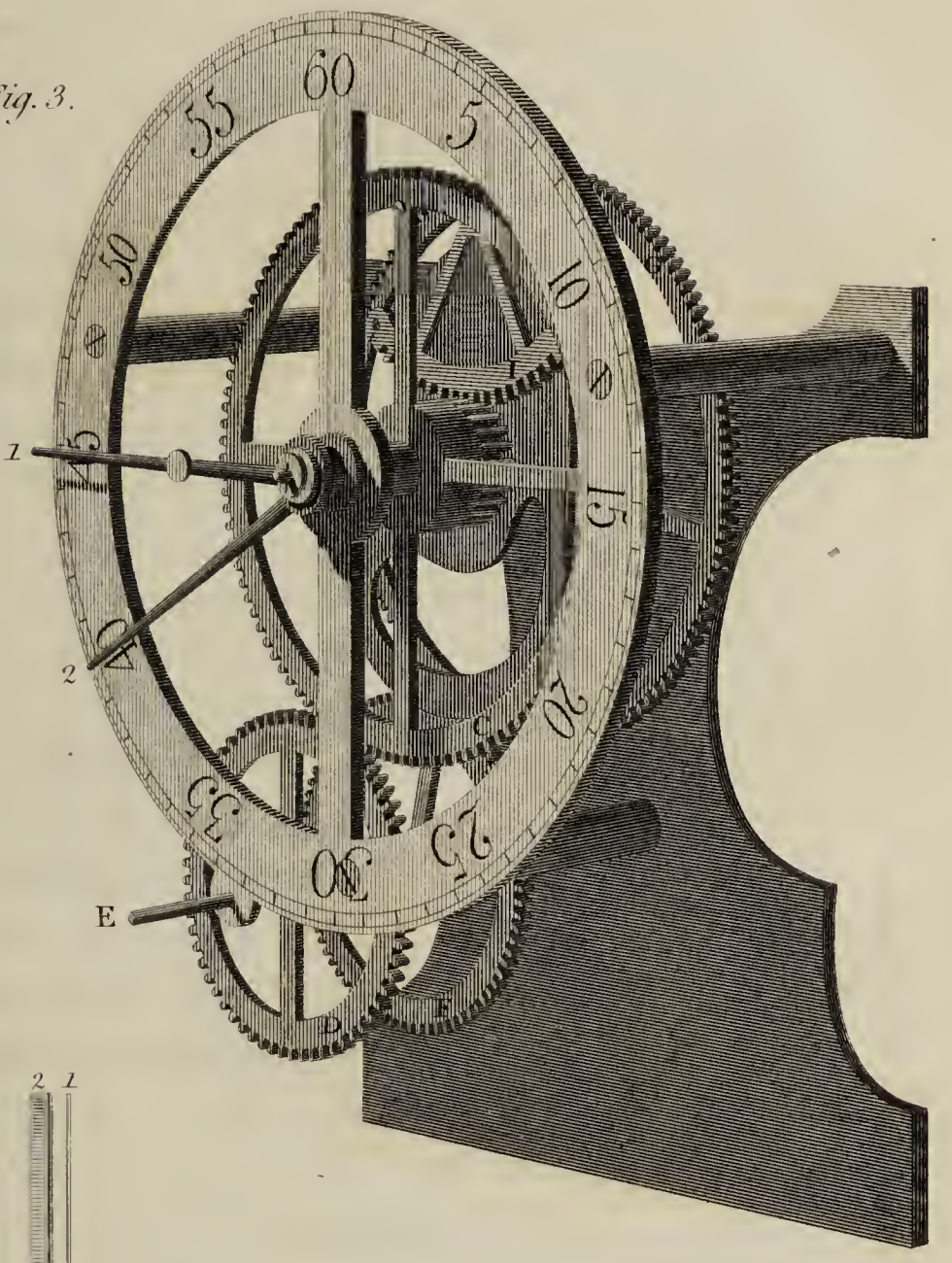


Fig. 1.

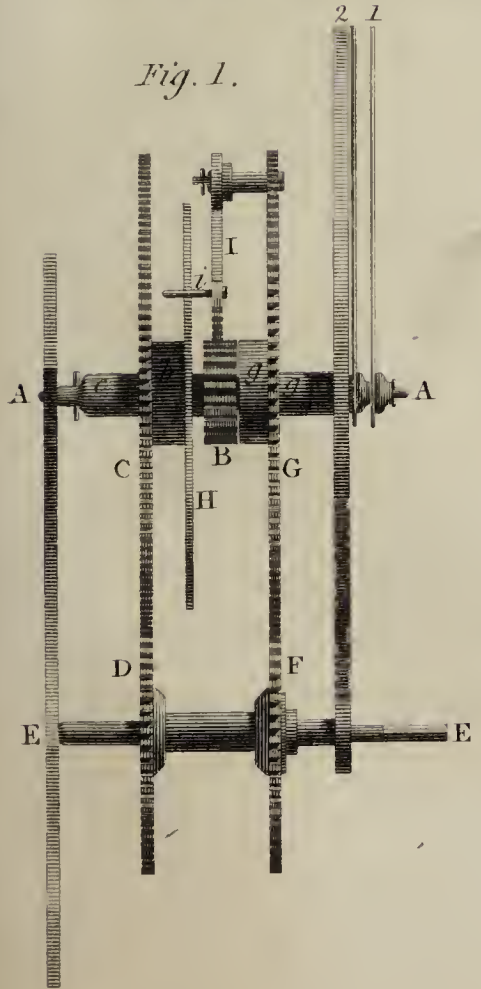
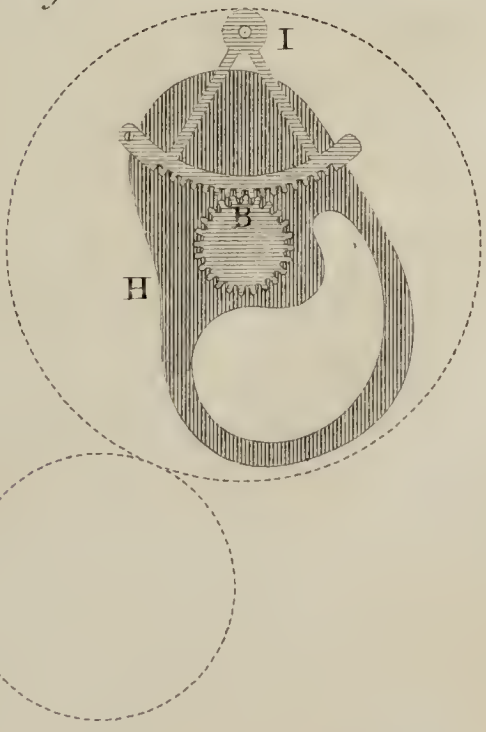


Fig. 2.



Drawn by M.A.Nicholson.

Engraved by J.B.Taylor.

steel, on the extremity of which is the mean time hand 2. The minute wheel drives a wheel D of 64 teeth, keyed on the arbor E E; the fore pivot of this arbor is squared, by which it may be turned at pleasure, so that the equation may be set right, by means of a table, if at any time the clock should have stopped. On the same arbor is fixed another wheel F, of the same diameter, containing 79 teeth, that drives a wheel G of 137 teeth screwed to the socket *g*, *g*; this socket turns freely on the arbor A A, and to it is also screwed the equation plate H. In the periphery of the wheel C there is a stud carrying a toothed quadrant II, which works in the nut B; a pin *i* is fastened in one extremity of the quadrant, which, by the revolving of the equation plate, is moved backwards and forwards; but in order to keep the pin in contact with the plate, a piece of very narrow watch spring is inserted in the boss of the minute wheel, hollowed out for that purpose; this spring, which ought to be weak, is hooked to the arbor of the nut B.—*Fig.* 2 represents a front view of the quadrant, nut, and equation plate 2, by which the operation may be readily understood.

This apparatus cannot conveniently be placed on the centre pinion so as to derive its motion from it, but motion may be communicated from the movement to the minute wheel in any way the ingenious artist may judge best calculated to suit the particular construction of his clock.

Of dividing the Equation Plate.

As the dividing the equation plate may appear difficult to many, I have judged it necessary to offer some directions

tions to facilitate the business. For this purpose, I have constructed an Equation Table for a year, divided into 137 parts, each part consisting of an interval of 64 hours, and consequently corresponding to one tooth of the wheel, which carries the equation plate. By this means the operation of dividing the plate is rendered as easy as that of a common snail. The method is as follows:—Having fixed in the extremity of the quadrant a temporary screw with a sharp point, I put the minute wheel with the quadrant, and the wheel of 137 teeth with the equation plate upon the arbor A A, and placed them in the frame. A piece of iron wire flattened, with one end bent to a right angle, was held fast to the frame by a hand-vice, with the bent end resting in the teeth of the wheel, so as to retain it in any position. The minute wheel was made fast to the frame by a clamp, the mean time hand pointing exactly to 60 on the minute circle; the apparent time hand was then brought to 60 also, and the screw in the quadrant, whose point was nearly in contact with the plate, was gently struck with a hammer, so as to make a small impression; I then shifted the plate forwards by one tooth of the wheel, and moved the apparent time hand forwards, as near as the eye could judge, 39 seconds, *(see the annexed table)* and made a second impression; then moved the wheel another tooth, and set the hand to 1 minute 14 seconds; and thus I proceeded until I had got a series of dots all round the plate, to which it was afterwards filed away.

A Table

A Table useful in dividing the Equation Plate.

M S	M S	M S	M S	M S	M S
0.. 0	0..37	2..51	15..40	1..29	12..41
+ 0..39	1..11	2..12	15..57	2..47	12.. 7
1..14	1..46	1..29	16.. 8	4.. 9	11..30
1..46	2..20	− 0..42	16.,15	5..18	10..50
2..16	2..54	+ 0.. 6	16..16	6..28	10.. 7
2..41	3..25	0..56	16,.10	7..36	9..23
3.. 4	3..55	1..49	15..58	8,.40	8..37
3..22	4..22	2..43	15..41	9..40	7..49
3..37	4..47	3..38	15..17	10..35	7.. 1
3..48	5.. 8	4..33	14..47	11,.25	6..11
3..55	5..27	5..29	14..12	12.. 9	5..22
3..58	5..42	6..25	13.,29	12.,47	4..32
3..56	5..54	7..21	12..43	13..20	3..43
3..50	6.. 2	8..16	11..50	13..47	2..55
3..41	6.. 6	9..10	10..54	14.. 7	2.. 8
3..27	6.. 5	10 . 1	9..52	14.,23	1..23
3..10	6.. 0	10..52	8..42	14..32	0.,40
2..49	5..51	11..40	7..36	14..36	0.. 0
2..26	5..37	12..26	6..24	14..35	
2.. 0	5..19	13.. 8	5.. 8	14..28	
1..32	4..57	13..47	3..50	14..16	
1.. 2	4..31	14..22	2..30	13..59	
+ 0..30	4.. 1	14..52	+ 1,.10	13..37	
− 0.. 4	3..28	15..19	− 0..10	13..10	

The

The SILVER MEDAL *was this Session voted to Mr.* WILLIAM HORN, *of Chatham, for a Machine for cutting Canvas for Shipping. The following Communication was received from him, an Explanatory Engraving is annexed, and a Model of the Machine is preserved in the Society's Repository.*

SIR,

A FRIEND of mine, who resides in the country, has invented a machine to cut canvas, for the use of riggers in His Majesty's Dock Yards, which has been much approved of by the several Commissioners at Chatham, Plymouth, &c., and is in constant use at those places. The saving to Government both in labor and canvas, is undoubtedly very considerable. He is desirous of submitting a model of the machine to the Society for the Encouragement of Arts.

The inventor can procure Certificates from Sir Robert Barlow, the Commissioner at Chatham, and the other distinguished Officers of the Dock Yards, on the usefulness of the machine. No patent has been applied for for it.

I have the honour to be,

Sir,

Your most obedient Servant,

J. BROTHERS.

No. 9, New Broad Street,
October 23d, 1812.

To C. TAYLOR, M.D. SEC.

CERTIFICATES.

Certificates.

A Copy by G. Davis, by Order of Sir Robert Barlow, Commissioner of Chatham Yard.

Chatham Yard, August 18th, 1807.

Sir,

In return to your minute of 15th instant, to report on the machine (invented by Mr. William Horn,) for cutting out reef, middle, and foot bands, also parcelling for the riggers; we beg leave to inform you, that since the date of your minute in May, 1806, the said machine has invariably cut out all the new and old canvas that has been appropriated to the above purposes, and that we find it in every respect to answer extremely well: moreover, much time and expense is saved in the rigging house by its adoption; and as old canvas, previous to the said date, was issued in large quantity to the rigging house, it gave an opening to embezzlement, whereas the mode of cutting it in slips by the machine, will, in a great degree, prevent it.

We are, Sir,

Your obedient humble Servant,

Samuel Hemmans, Master Attendant.

Wm. Beare, Master Sail-maker.

To Charles Hope, Esq.
Commissioner, Chatham Yard.

This is to certify, that the machine for cutting of canvas, invented by Mr. Wm. Horn, has been, and now is constantly in use from the period of its adoption for ge-

neral use by the Hon. Navy Board, in 1807. And the said machine is still found for its utility highly beneficial to the Service. I conceive the advantage arising from it to be very considerable. I further add, that the said Wm. Horn is the sole inventor, as to my knowledge nothing of the kind was mechanically in use, or under the idea of any person, until Mr. Horn presented the said machine for the naval service.

M. Beare, Master Sail-maker.

Chatham Yard, Nov. 24th, 1812.

Further Certificates from Mr. Uriah Allchin of Chatham, Turner, Mr. John Cockup of Chatham, Carpenter, Mr. Thos. Freeland, Mr. Robert Seppings, H. M. Dock Yard, and T. Hulkes, Esq. of Rochester, one of His Majesty's Justices of Peace, were received in confirmation of Mr. Wm. Horn being the inventor of the said machine.

Directions for using the Machine.

First, fix the knives in the knife bar according to the width that may be wanted.

When thus fitted, raise them in a perpendicular direction, then convey the canvas between the two lower rollers, passing it between the two upper ones under the knife bar on to the receiving bar, when fastened, tighten the canvas in the machine, and put on the weights, turn the knives down on the canvas and cut it through; fix the knife bar firmly by the screw on the side. Observe, that as the canvas increases on the receiving bar, so it passes down the

the edges of the knives to the points, and should, when a bolt of canvas is finished cutting, be one inch of the edges to spare. The distance of the knives from each other are calculated for two feet canvas, (the standard width in England,) allowing in the third and fourth cut bands the middle pieces to be wider than the outside ones, in consequence of the salvage, which does not want turning in as the middle pieces do; there is allowed one inch on the width of the rollers, lest the canvas exceed in any shape, as it is in practice found to vary in its widths.

WILLIAM HORN, Inventor, Chatham.

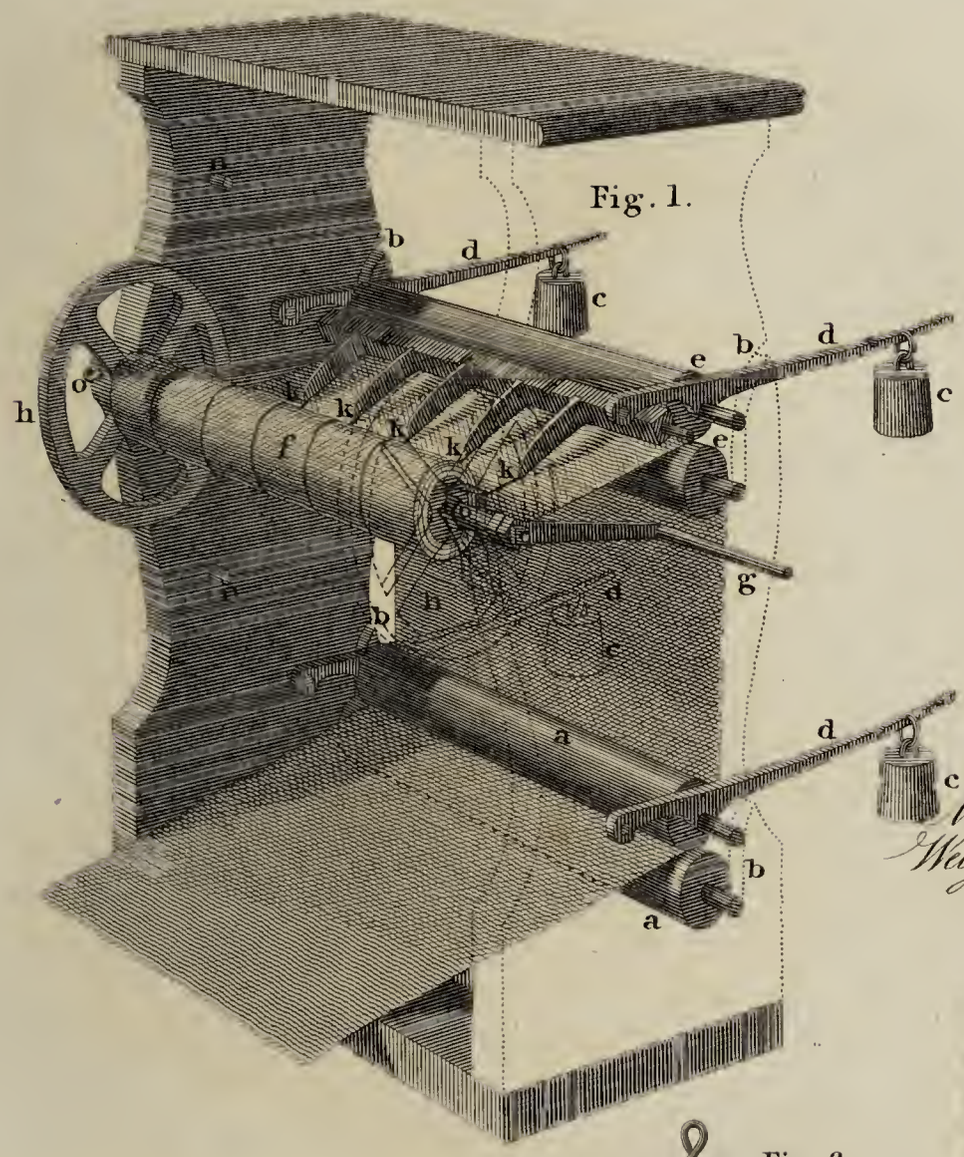
Reference to the Engraving of Mr. HORN'S *Machine for cutting Canvas Plate* 14, *fig.* 1, 2.

The canvas is first passed through the two bottom rollers *a a*, (these rollers fall easily into their places in the frame of the machine, by their pivots going into groves *b, b*,) then through the two upper rollers *e, e*, (these also fall into their places in the same manner as the two others) and the upper roller of each pair is pressed down on the canvas by weights *c, c, c, c*, hung on the levers *d, d, d, d*, each under roller is as long as the width of the frame, but the upper ones are made a little shorter that the levers *d, d, d, d*, may fall on the pivots, between their ends and the frame; there are notches on the longer ends of the levers to adjust the weights, by bringing them nearer to, or farther from the rollers. One end of the canvas is then fastened to the roller *f*, which has a winch *g*, to turn it round by, (the near side of the frame is shewn in dotted lines in order the better to see the work within,) this roller

has wheels *h, h,* at each end of it (the nearest shewn by dotted lines to guide the canvas straight on the roller; the knives *k, k, k, k, k,* are screwed into a bar of iron *i,* which is so fixed into the frame as to keep the knife points a little below the surface of the canvas, when drawn tight; the knives are sharp from the point to the bar, and almost laid on the canvas, so that the cut is begun before the canvas comes to the point, then by turning the winch the canvas is rolled tight round the roller *f,* and cut as fast as it goes into the number of slips the knives are placed for; the tightness, and consequently the cutting of the canvas depends on the resistance given by the weights *c, c, c, c,* pressing on the pivots of the rollers *e, e* and *a, a.* Fig. 2 shews the knives, and the holes and the groves in the bar to receive them; *l* is one screwed into the bar by its nut *m*; one side of the bar has groves for five, and the other three knives, by which the canvas may be cut into 2, 3, 4, or 6 equal slips, according to the number of knives employed; *n n* are pins to throw the lever's back against, while putting in or taking out the rollers; *o o* two pins, which keep the great roller *f,* in its place.

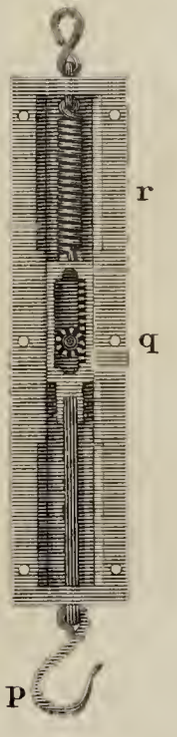
The

Mr. W.m Horn's Machine for Cutting Canvas.



Mr. W.m Martin's Weighing Machine.

Fig. 4.



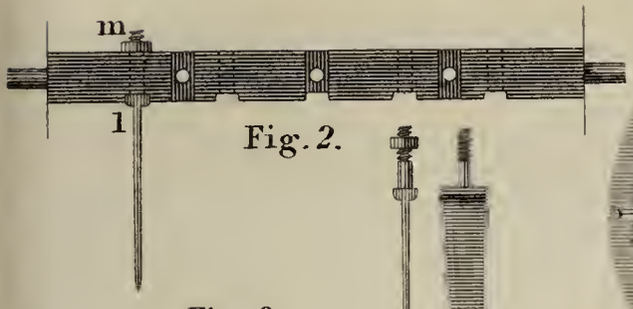


Fig. 2.

Fig. 3.

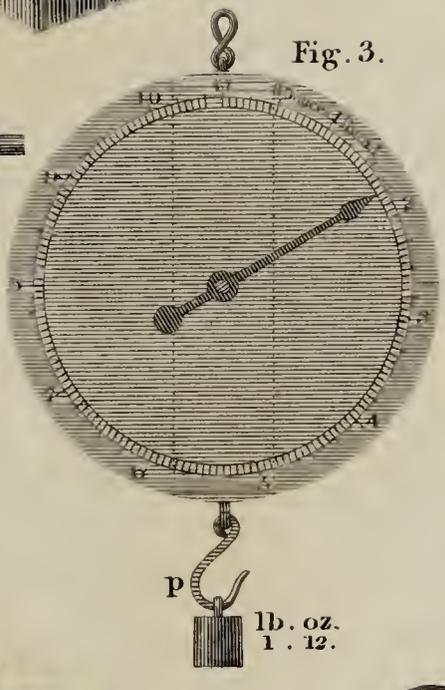


Fig. 8.

Fig. 7.

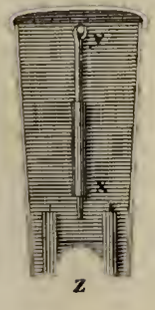
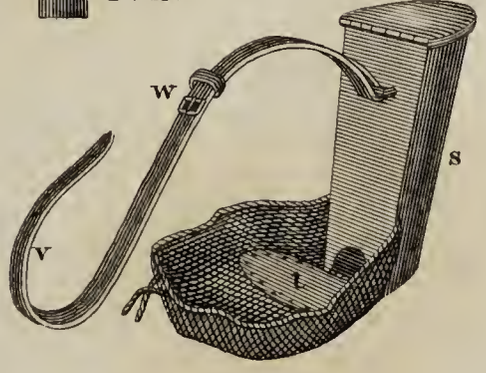


Fig. 5.

Fig. 6.



Mr. Cs. Drury's Horse Feeder when Travelling.

C. Varley del.

G. Gladwin sc.

The SILVER ISIS MEDAL *and* TEN GUINEAS *were this Session voted to Mr.* W. MARTIN *of High-st. Mary-le-bone, for an Index Weighing Machine. The following Communication was received from him, an explanatory Engraving is annexed, and one of the Machines is preserved in the Society's Repository.*

SIR,

I HAVE invented an improved method of weighing things of any nature, by a machine, which is very portable. The effect is produced by means of a helical spring acting within a tube or case, which spring contracts or lengthens according to the weights of the different bodies suspended from it. The weight is shewn on a graduated circle, to which an index points. I beg leave to submit it to the Society for their approbation.

I am, Sir,
Your humble and obedient Servant,
WILLIAM MARTIN.

No. 75, *High Street, Mary-le-bone,*
Dec. 6*th*, 1813.

Reference to the Engraving of Mr. MARTIN'S *Weighing Machine, shewing the Weight of any thing by an Index on a Dial Plate.* Pl. 14, fig. 3, 4.

The articles to be weighed are hung on the hook *p*, and the weight, viz. 1*lb*. 12*oz*. is pointed out by the index on the dial plate fig. 3; fig. 4 is a pinion under the dial plate on

the inside of which the index is fastened ; this is enclosed in a brass frame, with a rack on one side of it, to move the pinion. The helical spring *r* keeps this rack held up. The articles to be weighed being put on the hook *p* attached to the rack, pulls down the rack *q*, and consequently turns the index ; and the place on the dial-plate, where one pound pulls the index to, must be marked as one pound ; where two pounds turn it to, marked as two pounds, and so on, till the whole circle is marked, and then these pounds must be also divided into ounces, which fits the instrument for use. Fig. 4 shows the rack-spring and pinion enclosed in a case screwed to the back of the dial-plate, and to the upper part of which the spring is fixed, its lower part being connected with the frame of the rack ; and the instrument is held or suspended by a hook at its top.

The Silver Isis Medal was this Session voted to Mr. CHARLES DRURY, *of Mansfield, for a Method of feeding Horses, when travelling or standing in the Street. The following Communications were received from him. An explanatory Engraving is annexed, and the Apparatus preserved in the Society's Repository.*

SIR,

I BEG leave to submit to the inspection of the Society of Arts, &c. an improved apparatus for feeding horses, which can be used where the common nose-bags cannot. Considerable quantities of corn have been lost by

by horses refusing to eat their corn when blown upon in the nose-bags, or by throwing out the corn during the time of feeding. Both these inconveniences are obviated by the present plan, as the quantity of corn permitted to descend into the feeder can be regulated at pleasure, by a slide within the case, and the horses are not impeded in their breathing whilst using this machine, but may even be fed by this means whilst travelling at a moderate pace.

I remain, Sir,

Your humble servant,

CHARLES DRURY.

December 22, 1813.

To C. Taylor, M.D. Sec.

Certificates.

This is to certify, that I have fixed Mr. Charles Drury's travelling feeder upon several of our horses, in the presence of Captain Kynon. They take to it wonderfully, though they never had one on before; and by feeding them gradually, it will answer exceeding well in every respect, and is far before the present nose-bags for feeding his Majesty's Cavalry and other horses, when upon their march, or on the road, without loss of time. It is so constructed, that horses can take their feed without throwing their heads up, or putting the feeder to the ground.

It will not prevent horses from breathing whilst drawing in a cart. They cannot blow upon their food; and army horses will be able to take their feed whilst travelling at nearly the rate of four miles an hour, with the same

ease as if standing in the stable, and the apparatus can be taken off or fixed on in a minute's time.

ROBERT HEWITT,
Quarter-Master of 2d Life Guards.

December 18, 1813.

SIR,

I HAVE the pleasure to acquaint you that, agreeably to the request of the Society's Committee of Mechanics, I have again fixed Mr. Drury's travelling feeder upon several of his Majesty's Cavalry horses, and find that it answers exceeding well. Any horse, though he has never tried one before, will take to it immediately, and feed in the same manner as if standing in the stable, whilst travelling at the rate of three or four miles an hour; and a horse in military service is frequently very valuable.

It will prove of great national good for the feeding of all other horses when drawing carriages, or waggons, or in ploughing, &c. It will prevent loss of time, and be the means of saving the lives of many horses; it will save a great quantity of corn usually wasted in feeding them with the common nose-bag, as, when they have blown upon it, they will not eat it up clean. It can be carried upon military horses on their march with great ease.

I am, Sir,
Your obedient servant,

ROBERT HEWETT,
Quarter-Master, 2nd Life Guards.

Horse Guards,
December 25, 1813.

To C. TAYLOR, M.D. SEC.

THIS

This is to certify that Mr. Drury's travelling horse feeder, will prove of very great advantage, as there is no doubt that horses in the army, and all other horses, when drawing of carriages, waggons, ploughs, &c. will be able to take their food when upon the road, as sweet and clean as in the stable, without loss of time, which has been proved with his Majesty's cavalry horses at the Horse Guards, when going at the rate of two to four miles in the hour. It prevents any waste of corn, and likewise keeps the horse from blowing upon it; and the apparatus is so constructed as not to prevent him in the least from breathing,

H. Latham,
Quarter-Master, 2nd Life Guards.

Horse Guards,
January 3, 1814.

To C. Taylor, M.D. Sec.

Reference to the Engravings of Mr. Drury's *Traveller's Horse Feeder.* Pl. 14.—Fig. 5, 6, 7, 8.

Plate 14, fig. 5, shews the horse-feeder in use, strapped on a horse's head.

Fig. 6, the same off the horse. The tin vessel, or case, *s*, with a moveable lid, which contains the corn; *t*, the tin plate off which the horse feeds, surrounded by canvas, which is sown to the tin plate, and also to the sides of the tin case; this draws up like a purse, or bag, by a string run in the edge of it, which is tied round the muzzle of the horse. The strap *v* goes over the horse's head, through a ring under the plate *t*, and turns up again into the buckle *w*, where it is made fast.

Fig.

Fig. 7, the inside of the tin case, with a tin plate, *x*, sliding between two pieces of tin, as guides, and can be moved by the wire *y*, so as to shut or open more or less the hole *z*, through which the corn falls on the feeding-plate; this wire has a loop at its end, to hook on a pin at the top of the case, and prevent its slipping down; by this register, the horse may be fed quick or slow, and may even feed whilst travelling, as well as when standing still.

Fig. 8, the bottom of the tin vessel, and feeding-plate hinged to it, with the holes round it to which the bag is sewed; the bottom of the vessel slopes towards the hole, so that all the corn may come out of it, which it will do by the shaking of the horse's head, but cannot be lost, owing to the canvas so closely surrounding the horse's muzzle.

The Gold Isis Medal was this Session voted to Mr. F. Folsch, *of Oxford Street, for his Method of teaching young Persons to read and write. The following Communication was received from him. An explanatory Engraving is annexed, and Specimens of the Apparatus are preserved in the Society's Repository.*

SIR,

Of late years, peculiar attention has been paid to devise and mature plans which appear calculated to dispel the clouds of ignorance, and gratitude will induce succeeding generations to revere the memory of two illustrious characters, whose discoveries in promoting the education of children,

children, evidently tend to better the condition of the poor, to promote the good order of society, and to exalt the national character. In hopes that I may be permitted to contribute my endeavours, I beg leave to lay before the society a plan which I conceive will promote, in no inconsiderable degree, the education of the rising generation. The high opinion I entertain of the members composing the Society of Arts, &c. makes me anxious to have the honour of submitting my invention for facilitating the attainment of the elements of reading, writing, arithmetic, and drawing. The liberality of their sentiments induces me to hope that I shall meet with the same indulgent candour as those who are natives of the favoured shores of Albion*, having contracted, from a long residence in this happy country, a similarity of interests, sentiments, and feelings, with them.

The apparatus has obtained the approbation of numerous literary characters. It has lately been examined by a nobleman of great scientific attainment, and he has been pleased to bestow an encomium on it.

I shall be ready at any time to attend to explain its utility. I am, with the greatest respect,

Sir,

Your most obedient humble servant,

F. FOLSCH.

No. 237, *Oxford Street, Jan.* 26*th*, 1814.

To Charles Taylor, M.D. Sec.

Certificates.

Sir,

I have carefully examined your invention for the in-

* Mr. Folsch is a native of the Dutchy of Courland.

struction

struction of youth in the art of writing, which you call *The Juvenile Instructor*, and I have no scruple of giving my opinion that it is admirably adapted for that purpose.

STANHOPE.

Berner's Street, Jan. 8, 1814.

To Mr. F. FOLSCH, Oxford Street.

WE, whose names are hereunto subscribed, having seen and minutely examined the recent invention of Mr. F. Folsch, of Oxford-street, denominated by him *The Juvenile Instructor*, beg leave to express our entire approbation of his discovery, for the prospect it presents of becoming a great advantage to the public, while we perfectly agree in the originality of the invention, as far as its application is concerned in promoting the education of the rising generation.

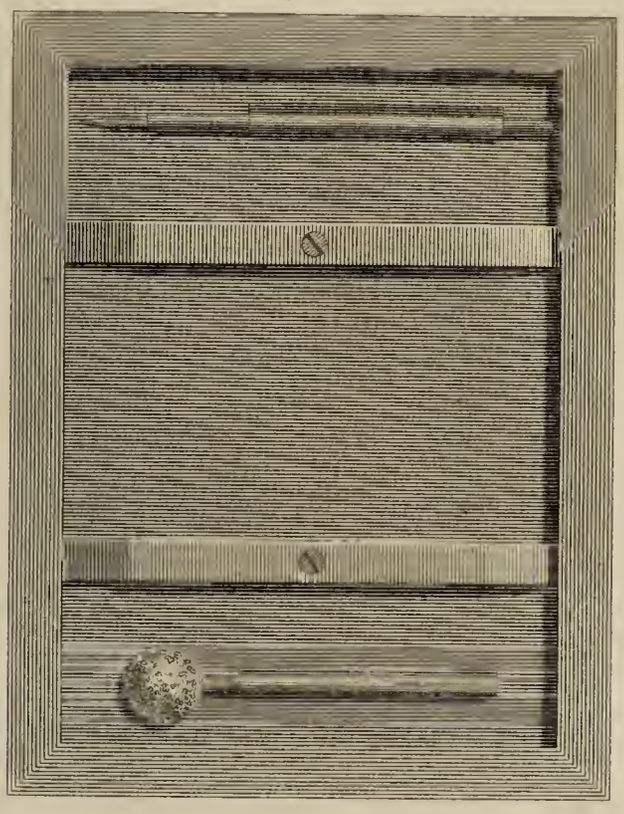
SAMUEL HACKETT, Chapel Court, South Audley-street.
E. A. DUNN, Stafford Row, Pimlico.
HUGH DAVIES, Piccadilly.
THOMAS WILSON, Tyndale Place, Islington.
W. F. LLOYD, Mason's Hall, Basinghall-street.
ALEXANDER FLETCHER, Minister Scots Church, Miles's Lane.
THOMAS COMYN, late Minister of Kennington Chapel.
JOHN DAVIES, Surgeon, 227, Piccadilly.
Dr. ESSEX, Turnham Green.
E. TURNER, Academy, 33, Hart-street, Covent Garden.
WILLIAM DOBSON, 166, Strand.
ROBERT I. THORNTON, Member of the Royal College of Physicians.

WILLIAM

Mr. F. Folsch's Substitute for a Slate.

Fig. 7.

Fig. 2.



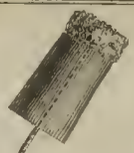


Fig 4.

Fig 3

Fig. 5.

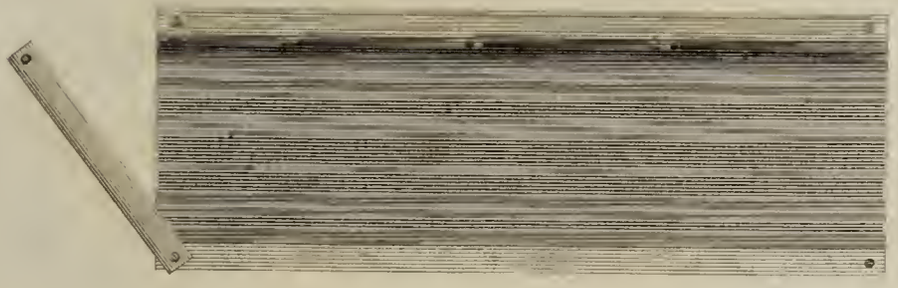


Fig. 6.

Fig. 7.

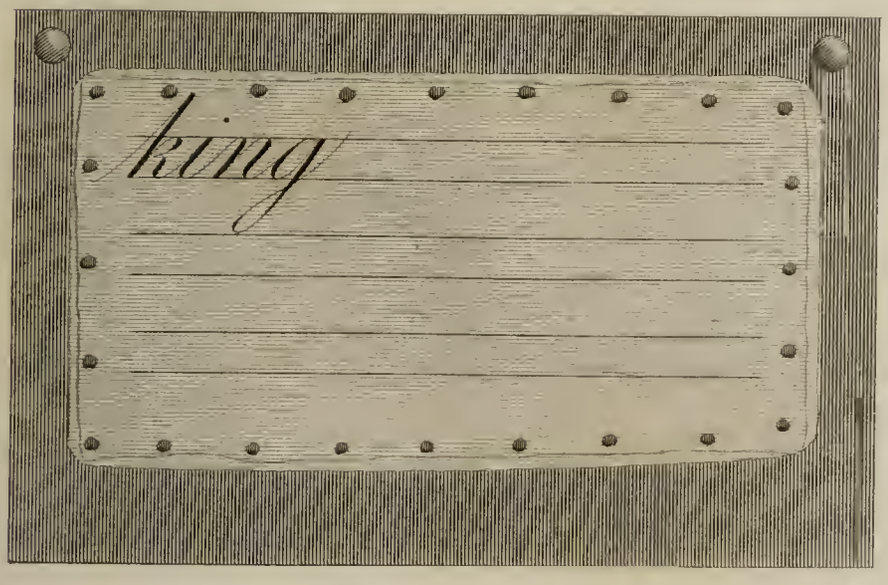


Fig. 8.

Mr. T. Heyworth's Horn Tablets.

by M. A. Nicholson.

Engraved by Jas. Davis.

William Day, Conduit-street.
Robert Joyce, Academy, Wilson-street, Finsbury square.

Especially *for private tuition*, and *Boarding Schools* for the opulent class of society. It may also be serviceable in self-tuition, or practice at home.

Joseph Lancaster.

Reference to the Engravings of Mr. F. Folsch's *Transparent Substitute for a Slate, Plate* 15, *figs.* 1, 2, 3, 4, 5, and 6.

This improvement consists in the substitution of a plate of common window glass, finely greyed or roughened on one side, mounted in a proper frame, so as to place copies of writing, drawings, &c. underneath it, to the common slate used in schools, &c.

Fig. 1 shews the front, and fig. 2 the back of one of these instruments, the former having a sheet of writing and blank lines, printed in white, upon a blackened paper, laid underneath the glass, ready to be traced over by the slate pencil, red chalk, steatite, &c. shewn in fig. 2, placed in a leather loop; and which marks, or traces, can be readily obliterated by the sponge fitted to its handle, also shewn in another loop in that figure. Fig. 3 is a section across, through the instrument, shewing the glass retained in its place by a projecting rim of the frame, the copy placed beneath it and retained there by the board, covered with green baize cloth, or other elastic material, being pressed close to the glass; and the board itself is firmly secured by the two turn buckles across it being turned into

into the grooves made in the two sides of the frame to receive them, exactly in the manner of most drawing boards.

Figs. 4, 5, and 6, represent a cheaper manner of constructing this instrument. Instead of a frame, a slip of wood is here shewn, hollowed out, as is more particularly exhibited in the section of it, fig. 5, having a narrower groove next to its back, to receive the slips of pasteboard on which the copies are fixed, and widening above, to fit the greyed glass; this glass is retained in its place by two slips of tinned iron, brass, &c. the edge of one of which is bent down at a right angle, so as, when applied on the top of the slip at one end, it entirely closes that end; the edge of the other is only turned down deep enough to secure the glass in its place, but, at the same time, to permit the slips of pasteboard, or copies, to be placed under the glass, or drawn out at pleasure; and for this purpose they are made rather longer than the slip of wood. This last slip of tinned iron, &c. is firmly rivetted to the instrument, whilst the other is so contrived as that, by unscrewing a brass loop at one end of it, it can be turned round the rivet at the other end of it, so as to permit the glass to be taken out occasionally. To this loop is also attached a sponge, made by gluing a piece of sponge to the end of a cork, through which a string has been previously passed, and secured from being drawn out by a knot tied upon it.

The particular advantage of this transparent substitute for a slate, is the great facility with which the copies of writing, drawings, &c. can be removed, and others substituted in their place.

FIVE GUINEAS *were this Session voted to Mr.* THOMAS KEYWORTH *of Sleaford, Lincolnshire, for his Method of Instructing Poor Children to Write in a cheap and easy Manner on Horn Tablets. The following Communications were received from him, an explanatory Engraving is annexed, and Tablets on this Construction are preserved in the Society's Repository.*

SIR,

I BEG leave to refer to the consideration of the Society of Arts, &c. a method of teaching the art of writing by means of transparent horn. I am inclined to wish that the knowledge of this invention was diffused, not merely because it appears of some value, but chiefly, because the more it is known the more likely it will be, to receive those improvements of which it is susceptible. I shall be glad if the information will be gratifying to the Society.

I am, Sir,
Your humble servant,
THOMAS KEYWORTH.

Sleaford, Lincolnshire, May 1st, 1814.

To C. TAYLOR, M. D. SEC.

Reference to the Engraving of Mr. KEYWORTH'S *Horn Tables.* See Plate 15.—Fig. 7 and 8.

The mode of constructing the tablet is as follows. A piece of board is provided, about eight inches long, four inches broad,

broad, and half an inch thick, see fig. 7, this board is made with what is technically called a *feather-edge*, see sect. fig. 8. By this means, when laid upon a flat table the upper side presents to the view an inclined plane with an even surface. On this board a copy written upon paper is posted. This copy consists of only two or three lines, the upper one being usually filled with letters, written in red ink, but the lower one's ruled with black ink and left blank. A piece of horn, such as lanthorns are made of, is procured, large enough to cover both the written and the blank lines of the copy. After this horn has been soaked in water half an hour, it is laid upon the copy as smoothly as possible, and fastened to the board with small nails, as shewn in fig. 7. A nail or stud is also inserted near each of the upper corners of the board, see fig. 7 and 8, whose head remains about one-eighth of an inch above its surface. One side of the tablet is now finished. Another copy, horn, and couple of nails, are fixed in a similar manner on the other side of the board, and the tablet is completed. This description will be rendered plainer by referring to fig. 8, in which the feather-edge of the board are shown, its thick edge, and the projecting nails; the word *king* is written between the upper lines of the copy, and the small nails with which the horn is fastened to the board, are shewn as well as the two nails or studs which project from the surface.

The manner of using the tablet is next to be stated.—When the children assemble for writing, every one is required to bring a piece of soft rag, and a bag containing a small quantity of dry whiting. The teacher then furnishes each child with a tablet, ink, and a pen made somewhat harder and finer nibbed than those used for writing

writing on paper. The scholar begins by tracing upon the horn the writing or different strokes which are discerned, in the copy beneath it, who then attempts to imitate the copy, by writing on the blank lines, when they are also filled, the child turns the tablet over, and acts in a similar manner with the copy there; the nails which project above the surface of the tablet serving to keep what was written on one side from being smeared while the child writes on the other. When both sides are filled, the child then holds up the tablet over its head, as a signal for the teacher, who takes the tablet, examines how the writings are executed; if badly, he orders the child to wipe the copy dry, and to write it over again, but if well written he gives the child a second tablet, with which it proceeds as with the former. By this time, a second child is waiting for the teacher, who receives the tablet, examines it as before, and if well written, he gives the second child the tablets which he had received from the first .This tablet the child finds has been written upon, and therefore takes the soft rag and wipes it clean and dry, but sometimes the hands of the children render the horn a little greasy, in which case it will not take the ink; this inconvenience is obviated by dusting a little whitening upon the horn, and then wiping it clean.

The advantages which are supposed to result from this method of instructing children to write are various. They are usually taught to write either on paper or on slates. Writing on horn seems to be superior to either of these; superior to writing on paper, because it is attended with less expense: if the tablets be made in the cheapest way, viz. by producing such pieces of horn, as are not suffi-

ciently large to be used in making lanthorns, consequently are of scarcely any value to the manufacturers; a tablet for two lines may be had for three-pence or four-pence, and when once provided will last for many years. It is attended with less trouble to the teacher, for no lines require to be ruled, and the pens last at least four times as long without mending as they would were they used on paper. It greatly assists the learner in forming letters; in writing on paper the copy is placed before him, and he must imitate it as well as he can; but in writing on horn tablets, the shape of each letter is discerned through the horn, so that any one who can hold or guide a pen may trace over the strokes which he sees in the copy beneath. The method now explained, seems to be preferable in some respects to that of writing on slates. It approaches much nearer to writing on paper. The transition from pencil and slate to pen, ink, and paper is so great, that children who can form their letters tolerably with the former, often do very badly with the latter; but the learner writes with the same instrument upon horn which he is afterwards to use on paper. What has just been said, with regard to *the assistance in learning to shape the letters, and join them together, which the child receives by this method, points out another advantage which it possesses over writing on slates.* This assistance is so great, that I believe a child will learn to write on horn in half the time it would either on paper or slate. I shall only add, that by this method the children write a much greater number of lines in a given time than they do when they write on paper. When those of the schools with which I am connected, wrote on paper, they commonly filled two pages each in an evening, consisting of about *twelve lines;*

lines; but now that they write on horn, a child will often fill sixteen tablets, amounting to *sixty-four lines.*

Some objections are made to this plan of teaching; these we purpose to notice: "If the copy consists of several lines, the letters which are first formed will become so dry before the whole copy is written, that there is difficulty in wiping them off the horn;"—but it may be replied, why should copies consisting of many lines be used? Such require large pieces of horn to cover them, and are much more expensive in proportion than smaller ones, besides, if a large piece of horn become damp (which it will do when written upon) it will not lie flat upon the board, but will be puffed up in the middle, and the writer will find the tracing of letters upon its surface very unpleasant. It is objected, "if the tablets are small they will require changing very often."—True, it will be necessary to change them every time a child has written four lines. But it should be remembered that there is no more trouble in changing a tablet, than there is in inspecting it, and will any one say that a child should be suffered to write more than four lines without his performance being examined.

Writing on horn has been adopted during the last two years in the school which I superintended, and experience has proved that it possesses the advantages mentioned. These were particularly apparent in the improvement of a very dull scholar, who had gone through the alphabet several times on a slate, yet could not join two letters together, but she very soon learned to write decently by this method, and the regularity of shape, slope, turn,

&c. which it soon induced in the writings of the more forward scholars was truly surprising.

In enumerating the advantages which this plan of writing on horn possesses over that of writing on slates, I might have mentioned one which, I believe, teachers will allow to be of considerable consequence: it is much more pleasing to the children, and whatever conciliates their affection is important. So far as I have had an opportunity of judging, there is no reward which can be given to Sunday School children for the same expense which they will esteem so much as being taught to write. Should the statement now given, be a means of introducing in any degree a more pleasing, a cheaper, or a more expeditious way of gratifying them than those in common use, I shall not think the time which I have bestowed upon it thrown away. I am aware, that the great objects of Sunday Schools (and they are those which I should wish ever to keep in view) are to habituate a number of children to regular attendance on the worship of Almighty God, and to impart to them religious instructions; and, when I view these objects, I am convinced, that they are of infinite moment, that they deserve all the attention which has been given them, and that they are of far greater importance than the mere teaching of children to read or write. These are useful arts, and they do well who teach them on Sabbath and week days to Sunday School children; and it appears that any improvement in teaching children to write, which either diminishes the expense, facilitates the operation, or renders it more pleasing, deserves attention, because it is

an

an improvement in that by which children are induced to attend where religious instruction is given them.

THOMAS KEYWORTH.

The SILVER MEDAL AND FIVE GUINEAS *were this Session voted to Mr.* J. STONE, *of Warwick Street, Golden-square, for a Double Spring to a Door, enabling it to open inwards or outwards. The following Communication was received from him, an explanatory Engraving is annexed, and a Door is hung on this Principle in the Antichamber of the Society.*

SIR,

HAVING invented a double swing door spring, I have herewith sent a model of a door hung upon this principle which I request you to lay before the Society of Arts, &c. for their inspection.

I am, Sir,

Your most obedient Servant,

JAMES STONE.

No. 30, *Warwick Street, Golden square.*
February 15*th*,

To C. TAYLOR, M.D. SEC.

CERTIFICATE.

A Certificate was received from Mr. J. TOMKINS, of Bevis Hill, Southampton, dated February 1814, addressed

to Mr. STONE, informing him that he had remitted him £.2 for one he had received, and that he thinks the invention a very good one, and such as must succeed.

Reference to the Engraving of Mr. JAMES STONE'S *Door-spring. Plate* 16, *fig.* 1, 2, 3.

Plate 16, fig. 1, a double spring affixed to a door, by which it opens equally well inwards or outwards; *a b*, fig. 1, two barrels containing two spiral springs on one axis, wound contrary ways; this axis is squared into the spring frame *c c* to keep it from moving round, and at each end is a pivot which enters into the door; these pivots keep the door from being forced away from the springs, so that their action is always certain. Two brass plates *d d* are screwed on the door to receive the pivots; the pivot holes are open at the back as in fig. 2, which is needful, to get the door on to the springs, for the springs being first screwed on the door-post, the door is opened at right angles to the door frame, and then slid on. The door is hung on pivots, the bottom pivot is fitted into the door at *e*, and the top pivot is rivetted into a plate of iron screwed upon the top of the door, and enters the door frame at *f*. The pivot lower hole is of brass, and screwed in the floor, coincident with the axis of the springs. The hole is turned a little wider at the bottom to hold oil. There are stops on each barrel *k l*, fig. 3; the stop *k* is on the lower barrel as fig. 1, and prevents the spring from acting farther than to shut the door, and the stop *l* on the other side of the upper barrel is to prevent the spring from acting farther than to shut the door the other way, by which means,

Mr. C. Wilson's
Sash Window.

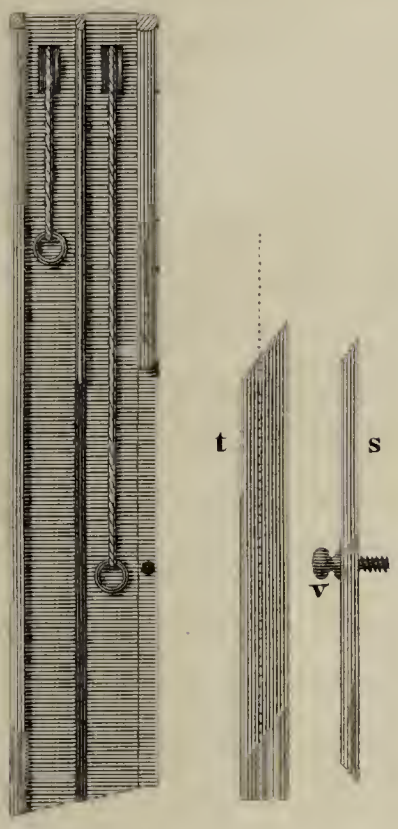
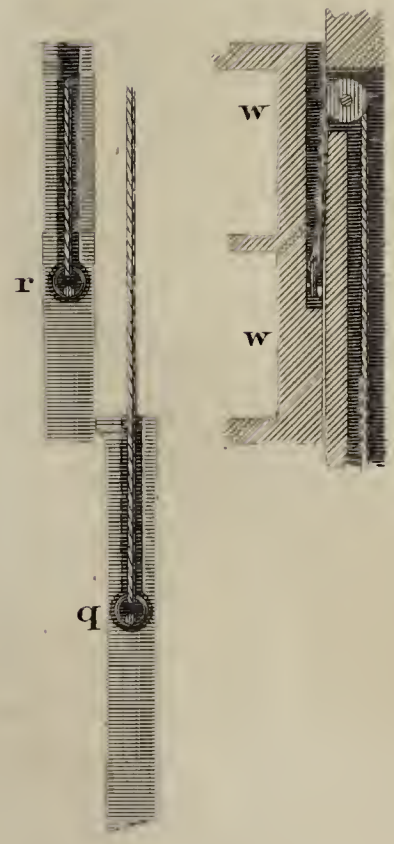


Fig. 4.



Mr. I. Stone's
Double Door Spring.

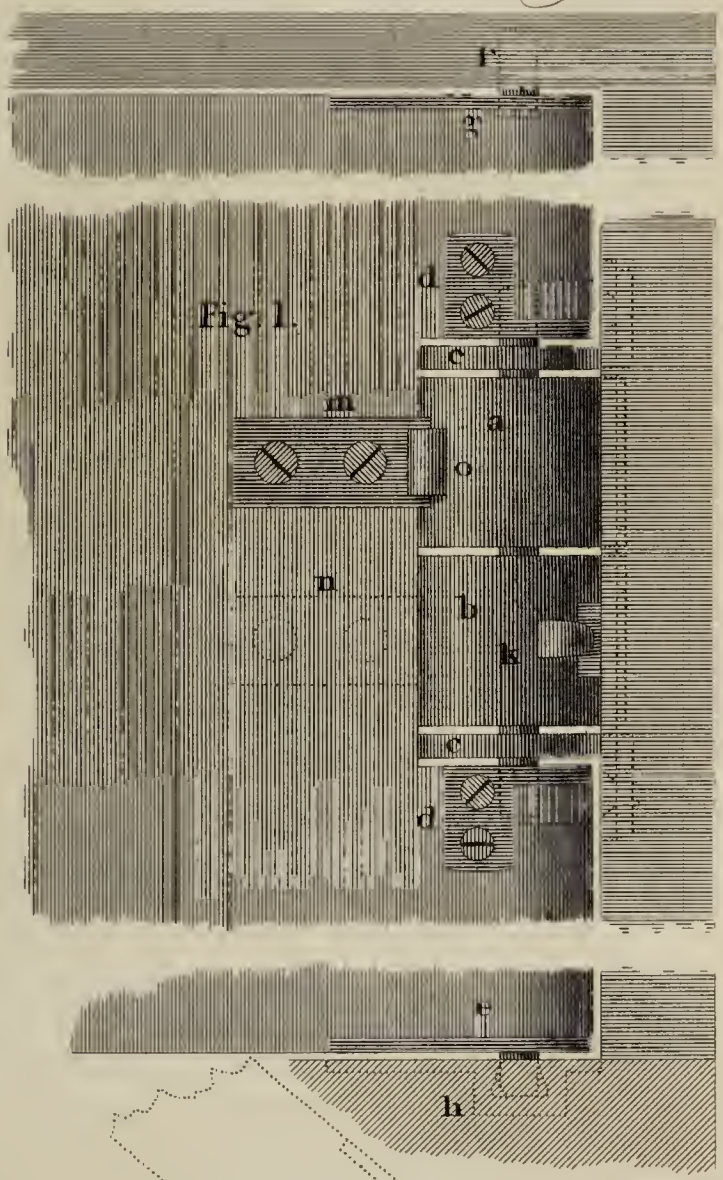


Fig. 1.

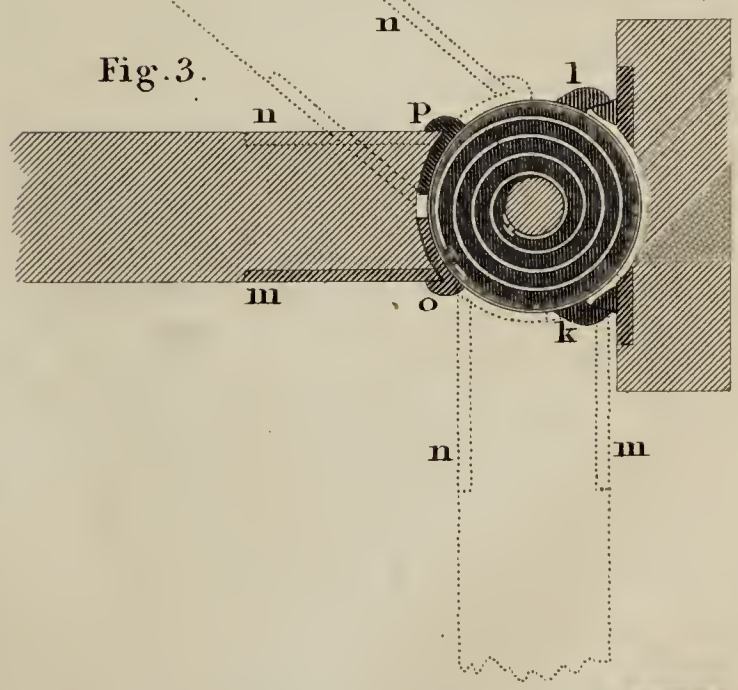


Fig. 3.

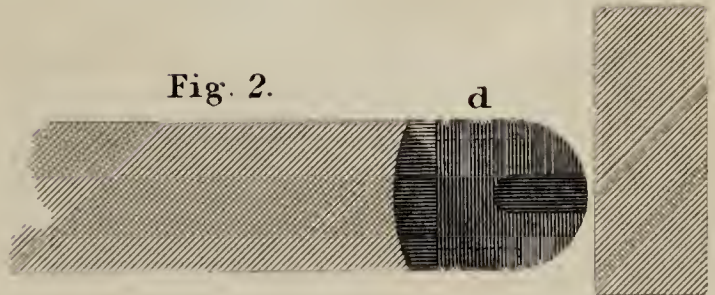


Fig. 2.

means, the springs remain wound up enough to hold the door when shut with the required firmness. *m n* are plates screwed on the door after it is hung, to catch in the hooks *o* and *p*, by which the springs act on the door ; when the door opens on the side *n*, it carries round the barrel *b*, fig. 1, by the hook *p*, fig. 3, as shewn by dotted lines, and when open on the side *m*, it carries round the barrel *a*, fig. 1, by the hook *o*, fig. 3, shewn also by dotted lines. These springs being thicker than the door, the extra thickness is let into the spring plate and door post, as shewn in fig. 3, and by dotted lines in fig. 1, by which means the door lies flat against the door post when open.

The Society, besides having in their Repository a model of Mr. STONE's double door spring, have likewise had one of the doors of their house, which is most frequently used, hung in the above manner, with one of them affixed to it, as a farther proof of its efficacy, and with the most complete success.

FIVE GUINEAS *were this Session voted to Mr.* C. WILSON, *Worcester-street, Borough, for a Method by which Sash-windows can be cleaned or painted without Danger to the Person employed. The following Communication was received from him, an Explanatory Engraving is annexed, and a Model of a Sash-window hung upon this Construction is preserved in the Society's Repository.*

SIR,

I request the favour of you to lay before the Society of Arts, &c. my invention of a method by which sash-windows may be so hung as to be cleaned or painted without danger to the person employed. By this means, many lives may be saved, and accidents prevented, besides a general advantage arising to the public. Hoping the Society will take it into consideration, and reward it according to its merit.

I am, Sir,

Your obedient humble Servant,

CHARLES WILSON.

No. 33, Worcester street, Borough,
October 30th, 1813.

To C. TAYLOR, M.D. SEC.

Reference to the Engraving of Mr. C. WILSON'S *sash-Window. Plate* 16. *fig.* 4.

Fig. 4 is a section of a sash-window frame, the sash lines having rings fastened to them to hook on to, or off the head of a screw placed in a hollow made in the side of

of the sash, as at *q* and *r*, at the bottom of the groves which are also made in the sides of the sash for the line, and each screw head is flush with the surface, so that the rings cannot get off, whilst the sash is in its place; *s* and *t* represent the lower halves of the bead and middle slip, one of which will stick in its place, and the other can be fastened by the screw *v*; these will take out, so that both the sashes can be taken into the room, and the sash line separated from them; and they may there be cleaned or repaired without the dangerous trouble of going outside the window. *w w* is a section of the sash and pulley shewing the ring of one of the lines hung upon the head of the screw in the hollow of the sash, as before described.

The SILVER MEDAL *and* TEN GUINEAS, *were this Session voted to Mr.* T. BOYCE, *Dean street, Fetter Lane, for his Invention of a Life-Boat or safety Buoy. The following Communications were received from him, explanatory Engravings are annexed, and a Model is preserved in the Society's Repository.*

SIR,

THIS is accompanied with the model of a life-boat, raft, or buoy which probably may be found not unworthy of the patronage of the Society of Arts, as in my humble opinion it combines superior powers with greater simplicity and accuracy than any invention of the kind which has hitherto come under my observation. The principle upon

upon which this boat is constructed, is such as to give it a superiority in point of steadiness, to any other construction. It can never be impeded by being water-logged, nor is it half so liable to be upset as a boat upon the keel or flat-bottomed principles. These latter may by expensive means be so contrived as to prevent them from sinking, but they may become water-logged, and consequently unmanageable in a rough sea, and it is a matter equally bad, whether a man perishes within a boat or without one, and in the event of such boats upsetting the persons who happen to be caught under them, can have no chance for life, and the bottom upwards can afford but a poor refuge to those who gain the outside.

The pendulum motion of the keel boat, and the aukward principle of the flat boats in case of violently rolling with much water on board, render them highly precarious in cases of extreme danger.

A boat or raft upon the plan which I respectfully submit to the Society, is constructed upon the most buoyant and simple principles, and it can be carried by two men from one part of the ship to the other. It may be made of wooden laths nailed upon circular wooden frames forming two cylinders with a pointed end; these frames have arms which divide each cylinder into five compartments, which may be either left open within, or filled with cork, or each made water tight. The frames are secured together by bars extending across through both cylinders. Upon the outside of the cylinders should be placed a coat of linen or cotton cloth, secured with water proof size or cement, over which two or three layers of brown pitched paper well cemented should be laid, over that another layer or coat of linen or cotton cloth should be cemented, and, lastly,

lastly, a covering of strong canvas well secured, cemented and painted.

This boat is so contrived that it is immaterial which side lies uppermost in the water, as both sides are separately supplied with a similar set of masts, sprit sail and rigging ready for setting up, and when the boat is cut away from the part of the ship where it hangs ready for use, the man fallen overboard, when he gets upon it, can hoist that mast and sail which lies uppermost, and follow the ship with nearly equal speed. The paddle answers the purpose of a rudder to steer by, and one paddle only is necessary, as it can easily be drawn out whichever side is uppermost.

The proper length of the boat is about nine feet. The diameter of each cylinder twelve inches, and the width of the grating between them twelve inches. The length of each mast nine feet, with sails and sprits in proportion. The weight of the whole about 180lb. and the price about ten guineas, and it will carry 250lb. weight with the grating clear of the water. The size or cement for uniting and covering the apparatus, should be made from equal weights of mastic, incense, rosin, and fine-cut cotton or cow hair; these are to be melted together with some powdered calcined oyster shells, and all mixed while boiling into a strong mass, which grows harder the longer it lies in water. Where calcined oyster shells cannot be got, quicklime will answer as a substitute for it.

Besides the saving of the lives of persons who fall overboard, this boat has the advantage of being able to carry a person safe to land where no other boat could venture, and convey a rope or dispatches on shore, that would be the

the means of preserving both ship and crew in cases of great emergency.

If my humble efforts should contribute towards the preservation of any of my fellow creatures, it would always be a source of happiness to, Sir,

Your respectful humble servant,

THOMAS BOYCE.

No. 15, *Dean Street, Fetter Lane,*
Jannary 19, 1813.

To Charles Taylor, M.D. Sec.

*** It appeared from information given to the Committee of Mechanics, that a small boat, on this principle, was dropped from the bridge at Monmouth, when the stream was very rapid, and, on a man getting upon it from a boat, it did not sink to the depth of the grating with him, and he was enabled to sail against the stream in it.

Reference to the Engravings of Mr. Boyce's *Life Buoy, or Boat.* See Plate 17. Figs. 1, 2, and Plate 18.

Fig. 1, shews a bird's-eye view of the life-buoy, *a a a a a a a a a a*, the bulk-heads, or partition, denoted by dotted lines, which form the five principal cross bars of the grating dividing the two cylinders with the angular end into ten water-tight compartments; *b b* the sail-mast, sprit, and paddle, tied up in canvass, which is secured along the middle of the wooden grating which connects the two hollow cylinders; this grating is made with thin bars, across three principal longitudinal bars, their ends covered by long thin slips of wood, *c c c c*; *d d d d d* are five rings to fasten the rigging to, shown more distinctly in.

Fig. 2,

Fig. 2, which is a section or end view, showing the two sets of rigging, one above and one below the grating; the dotted lines show the slips of wood placed as spokes to form the partitions in the cylinders; or they may be made of solid wood cut circular.

Fig. 3, shows how the life-buoy is hung to the stern of the vessel, ready to be detached when any person falls overboard.

Plate 18, exhibits a view of a boat of this description under full sail, with a person upon it.

The SILVER MEDAL *was this Session voted to Mr.* THOMAS CLEGHORN, *Old Hall Green, near Ware, for a Buoyant Line to preserve the Lives of Mariners. The following Communications were received from him. Explanatory Engravings are annexed, and Specimens of the Articles preserved in the Society's Repository.*

SIR,

I HAVE sent an account of a new invention, with some models, which I hope you will have the goodness to lay before the Society; and you would greatly oblige me by letting me know, in due time, the Society's sentiments concerning it.

I have the honour to be, with respect, Sir,

Your most obedient servant,

THOMAS CLEGHORN.

Old Hall Green, near Ware,
30th March, 1814.

To C. TAYLOR, M.D. SEC. *An*

An Account of a newly-invented Floating or Buoyant Line.

When a man who cannot swim (as is the case with the great majority of sailors), falls from a ship at sea, he often sinks before any assistance can be given him from on board; seldom can a boat be sent in time for his relief; and if any thing be thrown from the ship, with a view to support him, he is incapable of making the least attempt to reach it. This must frequently happen when the life buoy is dropt from a ship of war. It may save many men who can swim till they lay hold of it, but few, if any, who cannot swim; and it is chiefly for these that a new method is here proposed.

Let a buoyant line, from 100 to 400 yards long, be wound upon a reel which turns very easily, something similar to the reel on a fishing-rod, but more simple. To the end of this line let there be attached a wooden float, ballasted so as to carry a vane to show the direction and extent of the line when in the water. The square stern of the float, to which the line is fixed, will prevent the line from being drawn after the ship until it be all run out, or till the fallen man has got hold of it.

Let the reel with the buoyant line be permanently fixed upon the ship's stern, within reach of the man at the helm, and let the float, with its vane, be secured with a cord from falling when not wanted.

When a man falls overboard, let him who is at the helm, or any other person, cut the cord; the float, with the end of the buoyant line at it, will instantly drop astern, and be left behind by the ship, till either the whole of the line be run out, or till it be purposely stopped by a person on

on board, in order to pull up the fallen man who has got hold of it.

As the buoyant line will FLOAT *in the* ship's wake, it seems that a man falling overboard must very soon be carried to it; and even should he be quite incapable of aiming at it, when it touches him, he will, by a kind of instinct, which never quits a drowning person till the last, seize and hold it with all his strength. If the ship be going not less than six miles an hour, the man will be drawn by it so fast as to be kept above water, even without any assistance from on board, which, however, would almost always be given by turning the reel and winding up the line.

This plan might prove very useful for merchant ships. From which when a man falls, a raft of empty casks, or pieces of timber, with a rope tied to it, is sometimes thrown overboard, which, at best, gives him but a poor chance, especially if he cannot swim. He will often be lost before such a raft can be prepared; but even supposing it to be always ready, and instantly thrown over board, the man must be singularly fortunate who, being no swimmer, can notwithstanding seize and hold by the raft itself; as a common rope tied to it, sinking in the water, cannot (like the buoyant line) help him whilst he is between the ship and the raft.

It should seem that the life-buoys, which ships of war have for the sole purpose of saving men who fall overboard, would be more useful than they are at present, had each of them attached to it a buoyant line of 200 or 400 yards long; with it the fallen man would have a chance of being saved, by laying hold of any part of the line between the ship and the life-buoy, as well as of the life-buoy

buoy itself, which, as used at present, is here supposed seldom to be seized by a man at more than the distance of 400 or even 200 yards from the ship, unless he be a very good swimmer.

When a fallen man lays hold of a life-buoy without a line, as it is now used, he may sometimes remain hanging to it till he perishes with cold, or hunger, or be devoured by a shark, especially if he fall in the night.

Life-buoys without lines must often be lost, but with buoyant lines they would always be recovered, whether they had been successful or not in saving lives.

A buoyant line attached to a life-buoy, or float, or without either, being let go at any time of the day, or night, would almost inevitably come in contact with a man as soon as he reaches the ship's wake, and in a manner compel him to take and keep fast hold of it.

The buoyant line might occasionally, on dangerous services, by way of precaution, be let go into the sea, and there left extended till any apparent danger of men's falling be over. It would not retard the ship's motion; and, should a man happen to fall, he would have a good chance of being saved by laying hold of any part of the line, or the float at its end, which could not be drawn out of his reach by the ship till it had gone 400 yards (this being the line's length) from the spot where the man had fallen.

Should a man fall so far from the ship as not to be immediately carried into the wake, by turning the ship's head but a very little towards the side where the man is, the buoyant line would soon be drawn to him.

Were a man to fall overboard in the night, a person near the reel, by letting the line run lightly through his hand, or feeling, as an angler does, to know if any thing

is

is at his hook, would perceive when the man had got hold, and, of course, assist him by winding up the line, and drawing him towards the ship.

Any number of men might be saved by the method here proposed, the line being sufficiently strong for the purpose.

The Method of making Buoyant Lines and Ropes.

Many attempts have been made to find *one* pliable substance sufficiently strong to make a neat rope, or line that would float in water. Before these attempts, the only floating ropes known to the writer of this Essay, were such as are used in the Mediterranean, made of a kind of rush, growing in Spain, named *esparto*, or *esparte*, and those made in India from the rind of the cocoa-nut; but it appears, from experiments, that their buoyancy is entirely owing to the rough, unfinished state of their yarns, and the loose manner of laying them, which would render them very inconvenient and unwelcome on board of English ships. The fibres of each of these two substances, when properly combed and cleaned, have been found to sink in water, like hemp, and many other substances tried in the same manner; from which it should seem that there is no *one* substance fit for making a neat, strong, buoyant rope or line, and that the best kind yet discovered, consits of *hempen webbing*, or *flaxen inkle, with a heart of cork* sufficient to make it float in water. Hemp, flax, and cork, last very long without injury from being often wet and dry. Of these, models are sent for inspection, though very imperfect, for want of proper materials,

and practice in making them, as must often be the case with new inventions. It is hoped that they will suffice at least to give an idea of what they might be, were they to become an article of trade, as they would, if approved of, and introduced into ships in general. Then would webbing, inkle, &c. of a proper kind be made, and very cheap. The cork, it may be said, would cost nothing, as only old bottle-corks would be wanted, and the cutting and enclosing the cork in the webbing, or inkle, might be done at a trifling expence, and would be good employment for poor women and children.

A buoyant line 400 yards long, and of sufficient strength when on the reel, would form a cylinder of only about 28 inches in length and 4½ inches in diameter, or any other dimensions in proportion. It might be made and placed on a ship's stern, so as to prove no wise cumbersome nor inconvenient; and its appearance might be made even ornamental.

Though the models of the buoyant lines have each a *seam*, it is not liable to give way like a common seam, when the thread breaks. The thread of the seam is here in a manner interwoven with the substance of the line, and if accidentally broken, will not injure the line any more than would the breaking of a yarn of the line itself.

The buoyant lines, from their make, must be stronger than common spun lines of the same weight of hemp, and they are not liable to twist and entangle like spun lines.

A sketch is sent with intent to show the method of using the buoyant line. Should any further explanation be required, it will be given most readily to the utmost of the writer's power, independently of any pretension to the

honour

honour of a premium. He would think himself well rewarded were the Society to judge his idea worth sufficient notice to recommend it to the consideration of the public, that it might be taken up by some more able hand, improved, perfected, and adopted for the Society's chief object, viz. *the good of mankind!*

THOMAS CLEGHORN.

Old Hall Green, near Ware,
30th March, 1814.

The models of buoyant rope and lines sent are,

No. 1, a 17-10th inch of buoyant rope, 7 inches and a quarter in circumference, showing the proportions of hemp and cork to make a rope, or line, which will float in fresh water.

Their relative weights are nearly 15 of hemp to 1 of cork.

No. 2, a strong 1 4-10 inch rope, the heart of cork, covered with brown hempen webbing, or 1½ inch wide.

No. 3, another of the same, only 12-10th of an inch in circumference.

No. 4, a line with a heart of cork *doubly* covered with white flaxen inkle, 1 inch wide.

No. 5, another of the same, *singly* covered with the same inkle.

No. 6, another of the same, covered with inkle 6-10th of an inch wide.

N. B. The webbing was manufactured for the purpose, as nothing of the kind could be found ready made; nor had the maker a loom for weaving small webbing fit for a line of the size of No. 6, which, if made, would be very

proper for the reel, and greatly preferable to the inkle, which has been substituted in its stead, for the three last models.

SIR,

HAVING considered an objection made to the use of the buoyant line, that from the height of the situation of it from the water, a man fallen overboard might pass under it without being able to get hold of it; my opinion is, that the *weight* of the buoyant line, which will be considerably increased when wet in the sea; the weight of the atmosphere and the force of the wind continually pressing downwards the part of the line between the reel and the water, together with the slightness of the float's resistance, will never let the ship draw the line so tight as to raise any considerable part of it above the water, even when the whole line is run out, and the reel of course stopped. Suppose, however, a fallen man to be close to the ship, and the spot nearest to it where the line touches the water, to be 30 yards astern; if the ship be going only at the rate of six miles an hour, it would bring the point of contact of the line and water to the man, in nearly ten seconds. But cases of this kind will seldom or never happen, because the reel will turn and veer the line with such velocity, that it will always continue falling into the water very near the ship, until it be all run out, or till the reel be purposely stopped by a person on board.

Floating lines or ropes will probably be made useful for other purposes, as well as for saving men who fall overboard.

Many experiments were lately made on the coasts of Kent

Fig. 2.

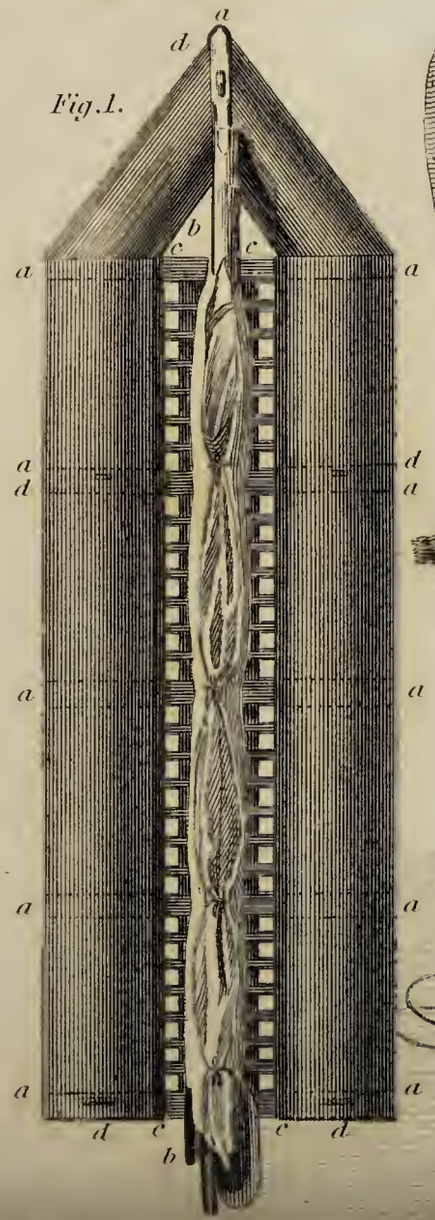


Fig. 1.

Fig. 3.

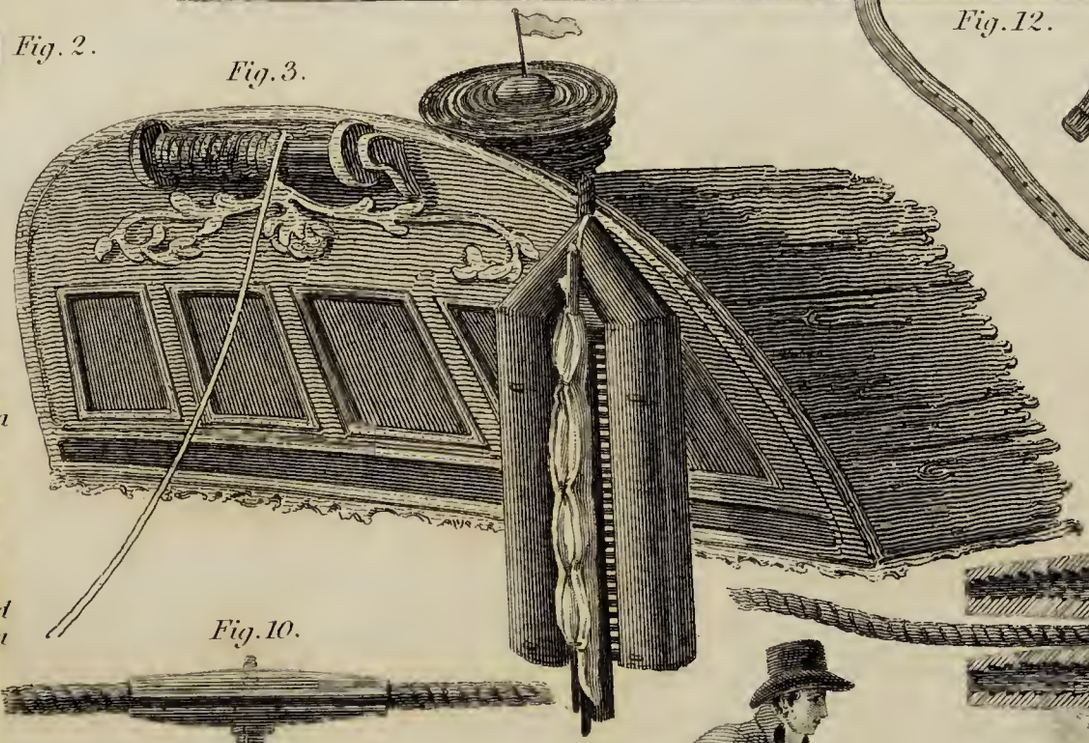


Fig. 12.

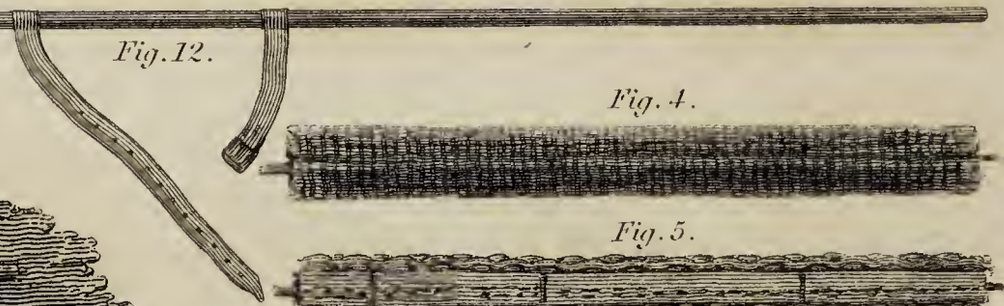


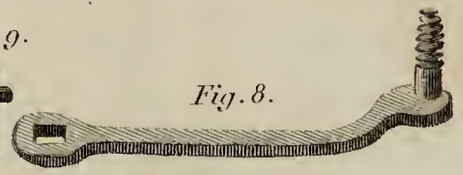
Fig. 4.

Fig. 5.

Fig. 6.

Fig. 9.

Fig. 8.



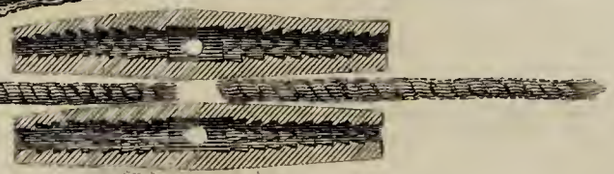


Fig. 7.

Fig. 10.

Fig. 11.

C. Varley del.

A. Warren sculp.

M.r Bowers Life Buoy. M.r Millers Safety Poles. M.r Cleghorns Buoyant Line.

Kent and Sussex, when the wind and tide were against the land.

From a boat 150 or 200 yards off the shore, was thrown a buoy, with a floating line attached to it. Thus it always landed; but with a common line it only went about 40 or 50 yards from the boat, and then stopped, being held as if at anchor by the weight of the line, even where the bottom was smooth sand, and much more where there were stones or weeds.

These experiments were made with a view to establish a communication between vessels stranded near the shore and the land. They were repeated both when the sea was smooth, and when there was a high surf. But it has been objected to their utility, that vessels are only wrecked in storms, when the tide usually runs so strong along the shore, as to prevent from landing any thing (from a ship) with a line attached to it; granting this, it might still perhaps be useful in the Mediterranean, and on other coasts where there is either no tide, or where it does not run along the shore.

If the Society should honour with their consideration the little essay and models I addressed to you, expressing their sentiments concerning it, it would be highly esteemed, and if any other explanations were required, I would endeavour to give them to the best of my power, in writing or personally.

I am much indebted to you for your obliging civility, and have the honour to be, with respect, Sir,

Your most obedient Servant,

THOMAS CLEGHORN.

Old Hall Green, near Ware, April 18th, 1814.

To C. Taylor, M.D. Sec.

Further Answers to an objection made to the use of the Buoyant Line.

It has been objected, that the end of the buoyant line would, sometimes, drop into the water between the ship and the fallen man, and that the man being thus astern of the line's end, it could be of no service to him.

In answer to this objection, it may be observed, that supposing the man to be astern of the line's end, if he could not swim at all, he would probably be unable to lay hold of it; but, if he could swim, however little he might reach it, as it must drop into the water very near him (if let go immediately on his falling) and remain almost in the same place till the whole line be run out; granting, however, that in this case, the buoyant line could be instrumental in saving those only who *can* swim, for them alone, it might be worth adopting. But, from experiments just made, it appears, that cases such as that proposed, may be almost entirely prevented; thus—

Should the *reel* be approved, let the line be wound upon it all *excepting* 30 *or* 40 *yards*. Let these be carefully *coiled* in a small tub or basket. Instead of a *float with a vane* (which is not essential,) let there be affixed to the end of the buoyant line a piece, or ball of wood of the properest shape and weight for throwing, which, when not used, would be placed upon the coil close to the reel. When a person falls overboard, let the most expert thrower nearest the coil, take up the wooden ball, and either throw it from his hand, as he would a stone, or heave it as he would the lead, right along the ship's wake. In this manner it is thought he might send it 30 or more, but at least 20 yards

yards astern the ship, and some way beyond the fallen man, by which means, the line would either drop directly upon him, or so near to him that he must almost instantly feel and lay hold of it.

The reel, it is thought, would be found very convenient for veering, for quickly winding up the greatest part of the line, and for keeping it always ready for use; but should seamen object to it, instead of 30 or 40 yards (as has been proposed) *the whole line* might be coiled and kept always ready for use, in a small tub or basket, having a wooden ball fixed to its end, to be used when wanted, as has been mentioned.

By either of these methods, no time would be lost in cutting a cord as was at first proposed, and the line's end (with the ball) instead of dropping perpendicularly, would fall at least 20 yards astern of the ship, whilst the man would be between them, in a favourable situation to be saved by laying hold of the buoyant line.

Reference to the Engraving of Mr. THOMAS CLEGHORN'S *Buoyant Line. See Plate* 17, *figs.* 3, 4, 5, *and* 6; *and also Plate* 18.

The buoyant line may be placed for use in the two following methods.

See fig. 3, where the buoyant line is either wound on a reel fixed to the stern of the vessel and where part of the line is seen running out, or it may be coiled up in a tub, as shewn in the vessel near fig. 3, with a floating ball and vane fastened to its end, laying in the middle of the

coil ready to be thrown out when a person falls over-board, which float and vane marks the extremity of the line, and point it out to the suffering person.

Fig. 4, a part of the buoyant line formed of corks, through which a string is passed in the manner of stringing beads, enveloped in strong webbing or tap, and firmly sewed and secured.

Fig. 5 is a longitudinal section thereof, showing the manner of connecting the corks, and the envelope of webbing in which they are secured.

Fig. 6 is a cross section showing the cork and manner in which it is enveloped by the webbing.

Plate 18 shews the buoyant line floating from the ship to the vane, and two persons in distress taking hold of it.

The GOLD ISIS MEDAL *was this Session voted to Mr.* G. SCOTT, *of George-street, Tower Hill, for his Method of uniting the standing Rigging of Ships when broken in Action. The following Communications were received from him, an Explanatory Engraving is annexed, and the apparatus is preserved in the Society's Repository.*

SIR,

A YOUNG man from Alnwick, named GEORGE SCOTT, having lately invented a very expeditious mode of uniting the standing rigging of a ship, which appears from its extreme simplicity likely to be of much service; I feel anxi-

ous

ous that the invention should be submitted to the consideration of the Society of Arts.

I am, Sir,

Your obedient servant,

PERCY.

Northumberland House, Dec. 1st, 1813.

To C. Taylor, M.D. Sec.

SIR,

I beg leave to submit to the inspection of the Society of Arts, &c. a method of uniting the standing rigging of a ship when broken in action. By which means, in the course of half an hour, a ship whose rigging is damaged, may be again prepared for action in a better manner than can be done in the common way in many hours. From repeated experiments, I have found that the rope would be more readily broke in any other part than in the place thus united. I have ascertained this effect by a crane. A broken rope can be thus united in half a minute. Frequent cases have occurred, where from ships being damaged in their standing rigging, they have been captured by vessels of inferior force, and which, by this means, might have been prevented.

I am, Sir,

Your humble servant,

GEORGE SCOTT.

George Street, Tower Hill, Dec. 2d, 1813.

To C. Taylor, M.D. Sec.

Reference

Reference to the Engraving of Mr. SCOTT'S *Method of uniting standing Rigging when broken in Action. See Plate* 17, *fig.* 7, 8, 9, 10.

Fig. 7, two semi-cylinders made of iron, within which the two ends of the broken rigging is to be laid, and secured by a screw fig. 9, which is screwed up tight by the key or winch fig. 8; the interior of the two semi-cylinders is toothed like a rasp to penetrate and so firmly hold the two ends of the rope, as to prevent their separation.

Fig. 10 shews the ropes so connected by the screw and semi-cylinders.

At one end of the key, fig. 8, is a screw to fasten the semi-cylinders together speedily, when only one rope is broken.

The THANKS *of the Society were this Session voted to* JOHN MILLER, *Esq. of Bedford, for his Method of Preserving Persons from Drowning when the Ice breaks under them. The following Communication was received from him, an explanatory Engraving is annexed, and a Drawing sent by him preserved in the Society's Repository.*

DEAR SIR,

I HAVE long had at several places contiguous to the river at this place, an apparatus in readiness to afford assistance in case of any one being in danger of drowning from the ice breaking under him. It is very simple, and I am persuaded would on trial be found efficacious.

It consists of two poles, each twenty feet long, cut out of

of a two inch deal plank. A leather strap to buckle, long enough to go over a person's shoulder, is fixed to one of them. The person using it grasps this pole with one of his arms and there fixes it, by means of the strap going over his opposite shoulder. The other pole, to one end of which a cord is fastened, he carries in his hand, for the purpose of conveying it to the person in distress, and which, by means of the cord, he is enabled to do at a very considerable distance.

The pole which is fastened to the assistant, from its projection of ten feet both before and behind him, must secure him, unless one can suppose (what is not likely,) that the ice under him will break to the whole extent of the pole, twenty feet before he can extricate himself.

Had an apparatus of this sort been at hand, the life of the person who was drowned in his attempt to rescue another in St. James's Park on Sunday, would most certainly have been saved.

A friend of mine has had the goodness to sketch a representation of it, which I have the honour to send you, requesting the Society's acceptance of it.

Permit me to add, that I believe a pole twenty feet long will of itself prevent the assistant's sinking, even if the ice should break for the whole length of it; but should a greater degree of buoyancy be thought requisite, a small quantity of cork fastened either to the middle or ends of the pole, would most assuredly give it buoyancy enough to support any person's weight.

I have the honour to be, Dear Sir,
Your most obedient Servant,
JOHN MILLER.

Bedford, Feb. 21st, 1814.

To C. TAYLOR, M.D. SEC.

Reference to the Engraving of Mr. J. MILLER'S *safety Poles. See plate* 17, *fig.* 11, 12, 13.

Fig. 11 shews a man, secured from danger by one pole being placed under his arm, and strapped round his shoulder, ready with another pole and line to throw to a person in distress from the breaking of the ice; one end of the line is to be retained in his hand, the other being fastened to the end of the pole.

Fig. 12 shews one of the poles and the straps attached to it.

C. Varley del.

H.M. Cleopatra. Buoyant. Fire & H.M. Boyne. Ice. Boat on a Safety Buoy.

A. Warren sculp.

Pl. 18.

PAPERS

IN

COLONIES AND TRADE.

The GOLD ISIS MEDAL *was this Session voted to Mr.* H. E. SIEVIERS, *of Lower Thames-street, for Herrings caught in the British Seas, and cured in the Dutch manner. The following Communications were received from him, and specimens of the Herrings were produced and examined before a Committee appointed for the purpose.*

SIR,

As a candidate for the Society's Gold Medal of the year 1814, I beg leave to present two samples of British Herrings, cured in all respects after the manner of the Dutch. Those marked *A* having been caught and cured on the coast of Shetland on board ship; those marked *B* were caught upon the coast of Yarmouth, and cured in my extensive warehouse there.

I beg leave to submit, that I have been employed in the cure of Dutch herrings near twenty years, twelve of which

I passed

I passed in Holland, the remainder in England. That for the last four years, I have annually exported from 3 to 4000 barrels of herrings of this cure to the continent, and small quantities actually to Amsterdam, and large orders for the West Indies, a decided proof I presume of the great superiority of my peculiar method of cure.

The whole of these fish were caught by vessels sent to sea for my account and cured by my direction and positive instruction; Certificates of which accompany the herrings.

Further, I have only to solicit the favour of an intimation when these casks are to be opened, in order that my Cooper may attend to shew them, a circumstance in some measure proper to their good appearance.

Subjoined you will receive the method of cure.

I am, Sir,

Your obedient Servant,

H. E. SIEVERS.

Dutch Herring Warehouse, No. 52, Lower Thames-st,
7th February, 1814.

To C. TAYLOR, M. D. SEC. to the Society of Arts, &c.

Method of curing Dutch Herrings referred to.

As soon as the fish are taken they are gipped, that is, gutted, and afterwards sprinkled with salt in their own blood, in large square, round, or oval tubs, about 1½ feet deep, in England called stir tubs, in Holland warr backs, where the fish are well stirred together, that the salt may take equal effect. The barrels must be ready to use instantaneously for packing with salt, of which I generally use four

barrels to 14 barrels (a last) of fish, they are then headed up and placed in the ship's hold, each barrel being marked with the date of heading, about four or five days after, wind and weather permitting; each barrel is again opened for filling up, and care must be taken that they are always kept in this state, otherwise they will become rancid, or what is termed rusty; in this state they are brought into port, here they are repacked as occasion may require, in various packages suitable to the market they are destined to. For home consumption and Baltic trade, they merely require to be filled up; for the West Indies they require repacking into small kegs of about one gallon each, with the addition of two pound of salt to each keg.

I do solemnly declare this to be the true method of curing Dutch herrings, as practised by me and my men in curing the samples now exhibited by me.

H. E. SIEVERS.

CERTIFICATES.

Yarmouth, Norfolk, March 1, 1814.

THIS is to certify, that there were cured upon my premises at Yarmouth, in the season of 1813, by and on account of H. E. SIEVERS of the City of London, and by his sole direction and management, twelve hundred and seventy barrels of white herrings, the whole of which were repacked and forwarded to the port of London for exportation, equal in all respects to sample marked *B*, the sample being a part of them.

Witness my hand, THOMAS BISHOP.

Yarmouth,

Yarmouth, Norfolk, March 1, 1814.

THIS is to certify, that there were repacked on my premises at Yarmouth, and forwarded to London for exportation from thence, two thousand nine hundred barrels of British herrings cured after the manner of the Dutch, and in my opinion in every way equal to the best Dutch herrings, by H. E. SIEVERS, of Lower Thames-street, London, and by his direction and sole management, and that the whole of the above fish were caught on the coast of Shetland in British vessels, in the season 1813, equal in all respects to the sample delivered, marked *A*, such sample being a part of them.

Witness my hand, THOMAS BISHOP.

London, March 1, 1814.

THIS is to certify, that we have examined and superintended the shipping of two thousand five hundred barrels of deep sea herrings, cured after the manner of the Dutch for exportation, and of the catch of the season 1813, which were shipped for and on account of H. E. SIEVERS, of Lower Thames-street, in the City of London, and were in our opinion equal to Dutch herrings.

(Witness our hands,)

JAMES CALDER, principal Officer of the fishery.

FRED. CAMPBELL, assistsnt Officer of the fishery.

*** On a minute examination of the samples of herrings produced to the Committee, it appeared that those caught in

in the deep sea of the coast of Shetland, were fatter and fuller of milts and roes than those caught on the coast of Yarmouth. Mr. SIEVERS stated, that herrings are generally known under three denominations, viz. the St. Michael's herring, the Highland herring, and the long shotten herring. That the deep sea fishing is carried on in sloops, each carrying ten or twelve hands, that they go to Shetland to clear out according to Act of Parliament about 16th June, and have then to return to commence the fishery at Buchaness off Peterhead on the 24th of June; that by being thus at present obliged to go first to Sheerness to clear out, they suffer great disadvantages by delays from wind and weather, in a voyage of 300 miles before they can commence the fishery at Buchaness; and that the Dutch have an advantage from not being obliged to go to Shetland; that the herrings caught in the deep sea off Buchaness are large, fat, and full-bellied; they are also richer in flavour, and more esteemed for home consumption and the Continent, but do not keep so well as the lanker herrings caught near Yarmouth, which last are better calculated for the West India markets; that the Yarmouth fishery is carried on in September and October, as the herrings come down the German Ocean.

The THANKS *of the Society were this Session voted to Mr.* PHILLIPS LONDON, *of Cannon-street, for his further Information on the Pickling of Mackerel and Preservation of Sprats. The following Communications were received from him, and samples of his Salt preserved in the Society's Repository.*

SIR,

HEREWITH you will receive a small cask of mackerel, which have been cured several months. I shall have the pleasure of calling at the Adelphi, and explain why they were not sent sooner.

I am, Sir,
Your obedient Servant,
PHILLIPS LONDON.

57, *Cannon Street, Nov.* 17*th*, 1813.

To C. TAYLOR, M.D. SEC.

SIR,

I RECEIVED your very polite and attentive note, and in consequence, should have done myself the honour of waiting upon the gentlemen of the Committee this evening, but am prevented by the severe weather. I therefore beg you to make my apology to them. The kit of mackerel I sent, was one remaining of the last Spring catching.

I herewith send you a small jar of mackerel in slices, which are said to be nearly equal in flavor to the anchovy.

Preparations

Preparations are made at Ramsgate for curing them upon a large scale early in the spring.

I take this opportunity of submitting to the Committee a specimen of *pickled sprats*, cured about six weeks ago in London, after having been caught two or three days. I have just now caused about one hundred barrels, fresh from the sea, to be done at Ramsgate, under the particular notice of Sir Wm. Curtis, Bart. Some such are now selling to the labouring poor at Spitalfields, under the association for their relief, *at one penny per pound*, in number about fifty fish. I presume to request the particular attention of the Society of Arts to this important subject.

And am,

Your very obedient Servant.

PHILLIPS LONDON.

Cannon Street, Jan. 29th, 1814.

To C. Taylor, M.D. Sec.

SIR,

I beg of you to present my respectful compliments to the gentlemen of the Committee, and also to the Society, for their vote of Thanks conveyed to me in your letters of 9th March and 21st of April last, expressing also their hopes that I would persevere in preserving mackerel upon the principle which I had the honor to communicate to them in May 1813, and which, they were pleased to say, they regard as an object of much national consequence.

I have not, Sir, been inattentive to the object; on the contrary, I have caused to be cured this last season at Ramsgate, upwards of twenty-five thousand mackerel.

There were cured at the same place this autumn, and sent to the West Indies, upwards of three hundred barrels of herrings, and, in the last spring, about fifty barrels of sprats, all preserved upon the principles which the Society did me the honor so highly to approve, and which, I am fully persuaded, is the most effectual, economical, and expeditious method of curing fish ever practised, and I am strengthened in this hope by observing in the fishing regulating bill, now depending, that encouragement is held out by a new clause introduced expressly for the purpose.

In expectation that the mode of curing fish by immersion in fully saturated brine of solid salt may become very general, particularly for herrings, I am induced to inclose to the Society the process more fully explained than it is in their volume for 1813, and calculated for curing fish on shore, and in any situation however exposed, even without any covering, as you will readily conceive that a surplus of salt on the surface of the brine will always meet and quickly saturate any rain whatever that may fall into the reservoirs.

I am, with respect and esteem, Sir,
Your obedient Servant,
PHILLIPS LONDON.

57, Cannon Street, Dec. 6th, 1814,

To C. Taylor, M.D. Sec.

Process for curing Herrings, Pilchards, Mackarel, Sprats, &c. by immersion in Brine of British "Solid Salt."

Reservoirs of any required size are to be provided in form of tanners' pits, or backs, or vats, or casks, perfectly water-tight,

water-tight, which should be about one half filled with brine made with the said salt of the sp. gravity of 1.206, water being 1.000, by dissolving about 28 parts of the salt in 72 parts fresh water.

The fish, as fresh as possible, are to be gutted or not, and without delay plunged into this fully saturated brine in such quantity as nearly to fill the reservoirs, and after remaining therein quite immersed for 5 or 6 days, they will be effectually struck, and so fully impregnated with salt, as to be perfectly fit to be repacked as usual with large grained "SOLID SALT," and exported to the hottest climates.

Brine is known always to be weakest at the uppest part. To remedy this, and in order that the brine be kept up to a uniform saturation, a wooden lattice-work frame, of such size as easily to be let into the inside of the reservoirs, is sunk an inch or two under the surface of the brine, for the purpose of suspending upon it lumps of 1 or 2lb. or larger, of "SOLID SALT," which effectually saturate whatever moisture may exude from the fish, and thus the brine will be continued of the utmost strength, and so long as any part of the lumps remain undissolved. The solidity of the lumps admits of their being applied several times, or whenever the reservoirs are replenished with fish; and the brine, although repeatedly used, does not putrify, nor do the fish if kept under the surface, ever become rancid.

All provisions are best preserved by the above method, particularly bacon, which, when cured by that process, is not so liable to become rusty, as when done by the usual method of rubbing it with salt, and yet is most effectually cured.

The solid salt may be procured in any quantity or of

any size of Mess. LONDONS, at the salt pit, Norwich, Cheshire; Mess. SMITH, MARTEN, SMITH & Co. America Square, London; or Mess. WHITEHOUSE & GALAN, Liverpool.

*** At the examination of Mr. LONDON'S pickled mackerel before the Committee, they were of opinion, that the best method of rendering them useful to the lower classes of people, would be by preparing them with potatoes in the following manner:—The raw potatoes to be scraped and boiled, and when nearly boiled sufficiently, one or more of the pickled mackerel to be then laid in the pan upon the boiling potatoes, and the boiling process continued till the mackerel is properly done, when the mackerel and potatoes are to be taken out of the water for use. On this plan, the potatoes will be rendered very palatable by the salt extricated from the boiling mackerel, the mackerel become tender and nutritious, and the mixture form a valuable and cheap diet.

The sprats will also answer prepared in a similar manner with potatoes.

The

The GOLD CERES MEDAL *was this Session voted to Dr.* WILLIAM ROXBURGH *of Calcutta, for the following important Communications on the different Products of the East Indies, and their several Applications to the Arts, Manufactures, and Commerce of the United Empire.*

MY DEAR DOCTOR,

GIVE me leave to introduce to you Colonel Alexander Beatson, late Governor of St. Helena; he is a man of great knowledge and merit, and can be of great service to the Society. I have troubled him with a duplicate of my paper on the growth of trees, the original was forwarded by the ship Lord Castlereagh, under the care of the Rev. Mr. JOHNS.

I am still alive, you see, and that is all. I am now reduced to a perfect skeleton, and weak in proportion.

I remain, Your's faithfully,

W. ROXBURGH.

St. Helena, August 31st, 1813.

To C. TAYLOR, M.D. SEC.

*** Dr. ROXBURGH since returned to England, and attended personally to receive the Society's Gold Medal on the 31t of May 1814. On the 21st October, he resided at No. 4, Park-place, Edinburgh, in a very dangerous state of health, but being indefatigable in his exertions, he has from thence favoured the Society with a further part of his Indian labours for a future Volume of their Transactions.

Notes to illustrate some few of the Trees in the annexed Table of Measurements.

1. An immense timber tree, with very straight trunk. On the *Gomooty* and *Fenny* rivers, the natives make their canoes of it. It is also highly esteemed for various other purposes, particularly the bottoms of boats and other immerged works.

2. One plant received from Sir Joseph Banks into this garden in 1807, when it was nearly twelve inches high, with its little stem about as thick as a goose-quill, is now, in 1812, about 25 feet high, constantly loaded with its beautiful, large, rosy, turbinate fruit, which, with an exuberance of dark green foliage, make it highly ornamental. The large firm sebacious aril, which is found attached to the seed, is held in high estimation in the *West Indies*, and much used in the stews and other messes of the Africans there.

3. This tree, which grows to a great size on most of the mountains over *India*, furnishes us with the real *olibanum or frankincense* of the ancients. See *Asiatic Researches*, vol. 9, p. 377, and vol. 11, p. 158.

4. The wood of this tree, which grows to a large size, is very like *Mahogany* in colour, but softer and more open.

5. Formerly called *Andersonia altissima.*

6. A most elegant tree, of great size and quick growth. The wood of a light chocolate colour, handsomely veined, and supplies the ship-builders at Calcutta with knees and other crooked timbers. It is strong, but unfortunately not so durable as teak.

7. An immense slow-growing tree, a native of the mountainous districts immediately east of *Bengal.* From its trunk the thin balsam, commonly called *wood oil* is extracted; See *Indian Plants*, vol. 3, No. 213.

8. The timber of this tree is of a dull reddish colour, hard and very

very durable; at *Rangoon* in *Pegu* it is called *Peema*, and there used for the knees and crooked timbers in ship-building.

9. The wood of this tree is both tough and hard; at *Rangoon* it is esteemed in the marine yard, and used for knees and other curved timbers: indeed most of the trees of this family furnish very excellent wood of a quality proper for such works as require much strength and durability. It is also strongly impregnated with tannin, though the greatest proportion of that principle resides in the bark.

10. In my former paper on this subject, it was called *nicotia. nifolia.*

11. And this, together with the fifth species *bialata*, were also considered *Terminalias*.

12. A very large timber tree, a native of *Bengal*, chiefly the *Morung* forests; its wood of an excellent quality, and may be reckoned our second best, teak being the first, and is particularly valuable for its great strength and durability when kept under water, and begins to be very generally used for such naval purposes as are immersed. The bark abounds in tannin, and used to tan with by the natives of the countries where the tree grows; also to dye brown and its various shades: from wounds, fissures, &c. there exudes large quantities of a pure resin, called in Bengal *Saul Dammer*, and often used as a substitute for pitch. The Camphor tree of Sumatra belongs to this noble genus, which makes the fifth species thereof described by me.

13. Two plants, (and the first that had reached the East Indies) were sent by the Honourable the Court of Directors to the botanic garden at *Calcutta* in 1795; and by the end of 1812, many thousand, probably not less than ten, have been reared from these two, by means of a ball of earth applied round the cut bark of the smaller branches, nearly as described in the 24th volume of the Society's Transactions; for hitherto not a single fertile seed has been procured from them in the Botanic Garden, though they blossom regularly during the hot season, that is, between

tween February and the end of May. We look anxiously for the period when the flowers will become fertile; for, until good seed can be procured, this most useful, quick growing beautiful tree cannot become so plenty as it deserves to be. Some of them are already sufficiently large for a variety of purposes, and the wood as highly coloured and close in the grain as can possibly be expected in trees of their age.

14. This useful tree furnishes both the *Chebulic and black*, or *Indian Myrobalans* of our M. M. See *Heming on medicinal plants and drugs, Calcutta*, 1810.

15. The *Belleric Myrobalans* of our M. M. are the produce of this species of *Terminalia*, and we have lately discovered that the *Citrine Myrobalans* are the produce of two new species of the same genus; one of them I have figured and described under the name *Terminalia Citrina*, and the other I call *angustifolia*, young thriving trees of both are now growing in the Botanic Garden: the former grows to an immense size on the mountains immediately east of Bengal. I have specimens of its wood by me, they are nearly the colour of Mahogany, but heavier and closer in the grain.

ON THE GROWTH OF TREES IN THE BOTANIC GARDEN AT CALCUTTA, IN BENGAL.

Table of the average Circumference of several of each Sort of the Trees mentioned on the Margin, in Inches and Quarters, taken four Feet and a Half above Ground, at the End of October, when the Year's Growth may be reckoned over. The difference between the Numbers in the adjoining Columns gives one Year's Increase in the Girt of each Sort.

Names of the Trees.	Synonyms.	Age (in Years) of the Trees measured (in 1803, 1804, 1807, 1808, 1809, 1810, 1811, 1812, and 1813).																													
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Achras Sapota	From the West Indies											23½	25½																		
Adansonia digitata																							188	204		216	220	223			
Ailanthus excelsa. R.				24	29½	33	37	41½																							
Alangium hexapetalum	S. Unkotha-nicochaka									21																					
Aleuritis triloba							28½	31				42	45	48½	51½	55															
Andrachne apetala R.										32½	34	35½	36¾	38	39																
1. ——— Chaplastra. R.	H. Chaplash	6								43	48	52	55½		60½																
Barringtonia acutangula. R.	S. Eedjul.—H. and B. Hedjul									42	43	44																			
——— racemosa. R											13																				
Bassia latifolia. R	S. Madhuca.—H. and B. Mahwa																					37½	38½	40							
Bauhinia retusa R.																								63		67					
——— parviflora	S. Vanarajah.—T. Arræ													41		46															
Berria Ammonnilla. R.	C. Ammonnilla			9½	11¾	14½	15¾	17	18																						
Bignonia suberosa. R.		12												61½	64½	67	69½														
———. Chelonoides	Tam. Pori-padyræ-marum						32½	35	37½	40	43																				
———.— undulata. R.						18½	19½		22½																						
———. suaveolens. R	S. Patali											34	37½																		
———.— xylocarpa. R.							20½	23																							
———. indica	T. Pampena										29	30		32																	
2. Blighia sapida. Bot. Ann.					11	15½																									
Bombax pentandrum	From the West Indies			22																											
3. Boswellia thurifera	S. Salaci.—B. Loban.—E. Frankincens, or Olibanum tree				13	15¾	17½	19½	21½																						
Briedelia spinosa	T. Cora-maun							39	41½		45																				
——— crenulata. R.	H. Canta-jarool							19	21¾	24¼	26½	28½																			
Bubroma Guazuma	E. Bastard-cedar, from the West Indies																														
Buchanania latifolia. R.	S. and B. Piyal.—Tam Maræda							20	22	24														49	50	51	52	53			
———.— angustifolia. R.						13	14½	16	17	19																					
Butea frondosa	S. Palosa.—H. Palash.—T. Maduga																														
Careya arborea. R.	T. Cumbi						17	21	24½	27									40	43						50	51				
——— spherica. R.												26½																			
Cassia sumatrana. R.		17½	23½			30	33	36½	38½	40½	43																				
—.— Bacilus Gært																															
——— nodosa									38	41	44	47	49																		
———. marginata. R							32½	34																							
Casuarina muricata. R.	In common garden mould				20	22				37½	41	44½	48	51½																	
The same tree in a very sandy soil					26½				39	42½	46½	50	52½	55																	
Casuarina nodiflora		3½	10																												
——— equisetifolia					13	17	21	25																							
4. Cedrela Toona. R.	H. Toon.—B. Poma										32½	35		42			48	49	50¼	52	55	57½	60								
Cinchona thyrsifolia. R.												36																			
5. Conocarpus latifolia. R.	T. Siri-maun				12½	15½			23	26½	29	31½	33½																		
———.——. acuminata. R.	T. Paunch-maun				15½	18	21½	25	28																						
Cordia latifolia. R.	H. Burrah-Lehsura							31	33½	36	38	39																			
——— Myxa	H. Lehsura							33½	35	37¼	39																				
6. Dalbergia Sissoo. R.	H. and B. Sissoon.—S. Shingshupa	5	11½	14½	17½			36½	41½	46	49½	52¾	56																		
——— emarginata. R.	Andaman Sissoo													25½	30				70	75			88	92½	96⅛	100½	104	107			
——— Ougenensis. R.							12½		14¼		19½	22	25	23	31	33		41½	42½	43½	44½	46	43								
——— paniculata. R.	T. Patseroo					41½	45¾		50½	54½	58	61																			
——— frondosa. R.					26	30½	34½		38½		51																				
——— zeylanica. R.	C. Belloo-labbee						29½		33½	37	40	42½																			
——— robusta. R.	B. Crowey	11																													
Dillenia augusta. R.		7																													
——— speciosa	S. Bhevya.—H. and B. Chalta											25	27½	29¼	30½	31½															
Diospyros Ebenum	Ceylon ebony tree			5	8¼	10½	12¼	14	16																						
7. Dipterocarpus turbinatus	H. and B. Suffet-Gurgon.—E. Wood-oil tree																														
Echites scholaris	S. Septa-perna.—H. and B. Shopt-porna																														
Erythrina suberosa. R.	T. Mooni-maduga										34	36	37½	38½	39½														54	57	
——— ovalifolia. R.	S. Paribhoodra											51	53	54½	56	58															
Euphorbia arborescens. R.										36	38																				
——— Ligularia. R	H. and B. Monosha shij						26	28	28¼																						
Fagara Retsa. R.	T. Retsa-maun								26½																						
Ficus indica. Amoen. acad. 1. 27	S. Vata.—B. Ber.—E. Banyan tree						45	53½	58½	65	72	79																			
One of the accessary roots of an old tree which reached the ground 12 years ago, and was then about as thick as a quill												45																			
													47½	50	52	54															
Gardenia dumetorum	T. Manga									19	21	22½																			
——— longispina. R.									18	19	20½																				
——— latifolia	H. Papara.—T. Caringua							22	23																						
——— lucida. R.										24	26½	29																			
——— costata. R.										12	14	16½																			
Garuga pinnata. R.	T. Garuga.—H. and B. Ioom										36	43	49																		
Gmelina arborea. R.	S. Gumbharee.—H. and B. Gumhar			18½			28½	31	32	33	33½																				
Gnetum Gnemon												7½																			
Gyrocarpus Jaquinii						28½	31½	32¼	33½	37																					

Names of the Trees.	Synonyms.	Age (in Years) of the Trees measured (in 1803, 1804, 1807, 1808, 1809, 1810, 1811, 1812, and 1813).																										
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Hardwickea binata. R.	Tam. Acha-marum.						20	24	28	30¼	33	36																
Herieteria minor. R.	H. and B. Shundree.							63	65	66	67	67¼																
Hura crepitans.	From the West Indies.							22	23½	25																		
Ionesia Asoca. R.	S. Asoca.—H. and B. Bussuck.												34															
Kleinhovia hospita.																			48½	53	—	—	—	—	71	74	77	79
8. Lagerstroemia Reginæ.	S. Arjuna.—H. Iarool.																											
——— grandiflora R.	S. Indradroog.					30	34	38	—	46																		
——— parviflora R.	T. Chinamghie.				27	31	36	39	41½	45																		
Laurus Cinnamomum.	S. Darasity.—Dar.chini. H. and B						16⅓	20½	24	28½																		
Melaleuca Cajuputi.	E. Cajuputi-oil tree									13½	15	17	18½	20														
Melia Azedarach.						37½	44¾	46½	47	47½	49½																	
—— robusta. R.							44	49½	51¾	53½	56																	
—— superba. R.		10	17	29	38	44	50	58																				
Mimosa Shirisha. R.	S. H. and B. Shirish							29	31½	—	—	35	37	39														
9. —— xylocarpa. R.	T. Conda-tangheru.—Burm. Pingadow						17	21	—	—	31½	34	36½	39	42	44½												
—— elata. R.										28	32½	—	—	—	50	55	59	64										
—— stipulata. R.	H. Amlooki							40	48½	—	—	66	74½	80	84½	89	95											
—— lucida. R.												49	56½	—	—	75	79½	83	88	93	97½							
—— dulcis. R.									59	64																		
—— Catechu	S. Chadira, and Kudheer the Catechu.						22	25	27	28	29	30¼																
—— odoratissima.	T. Shinduga. Tam. Sælæmarum							34	37	40	43	46	50															
—— arabica.	S. Barbura.—H. and B. Babul.								34¼	37	41	44																
—— biglobosa.	B. Supatah.	3																										
—— pedunculata. R.		7	11¼	16			21	25	29	33	36½	—	42															
—— Suma. R.	S. Sami.—B. Shain.						37½	38½	39¼	41																		
—— leucophloea.	Tam. Veel-velum.																											
Myristica aromatica.	E. Nutmeg tree.					3½	4½	{ 2½ fruitb. grd.		8½	10	10¾	11¼	11¾	12½													
Nauclea parvifolia. R.	T. Botu-Cadami.											31¼																
—— stipulata. R.					11	13½	—	—	19½	21																		
10 —— macrophylla. R.		8	15¾	—	—	29	33	36	38¼	40½	43																	
—— cordata. R.							21½																					
—— cordifolia. R.	T. Daduga.—H. and B. Keli-Codom.						22	25	—	—	—	36	38															
Nerium tinctorium. R.	T. Tshit-ankaloo.													36½	39½	43¼	46½	49	52									
Ochroma Lagopus.	From the West Indies.							32	36½	39½	42	45½																
Pentaptera paniculata. R.	Tam. Pæ-karakai.—T. Nimmeeri.							18	22																			
——— Arjuna. R.	S. Cocubah.							32	35½	38	40½	42																
11. ——— tomentosa. R.	S. Asana.—H. and B. Assan.														37	38					43½	44½	45½	47				
——— crenulata. R.							23	26	28	30	31¼																	
——— bialata. R.																		51	53½	—	—	62	64	66	68½	71	73	
——— angustifolia. R.								32	35½	38	40½	42																
Prosopis spicigera.	S. Sami.—T. Tshami.											27																
Pterocarpus marsupium. R.	H. Peet-shal.—T. Yeangashan.											23	26	—	—	—	—	40	42	43½	45	46½						
——— dalbergioides. R.	Andaman red-wood.									27	29½	—	—	38½	43	46½	49½	52½	55¼									
——— The same in more favourable soil														48	51													
Pterospermum acerifolium.	S. Kornikara.—H. and B. Conoc-champa.																						57	60	63	65½	68	70
Ricinus inappa.													31½	32¼														
Rottleria tinctoria. R.	S. and B. Poonag.										25	26	27½															
Sandoricum indicum.	Mn. Sandoricum																								78	80	83	85½	88	91
Santalum album.	Sandul-wood.—S. Chandana.									27	29	30½	32¼	34	35¼													
Sapindus saponaria.	From the West Indies.					20	25																					
——— laurifolius.									31½	34½																		
Sapium sebiferum.	Tallow-tree of China.															60	61¼	62¼	—	65½								
Semecarpus Anacardium.	H. and B. Bhella-toki.									32	34½	37½	40½	43	47													
12. Shorea robusta. R.	S. Sala.—H. and B. Shal-chucua.											14¼	16¼															
Spondias dulcis.	Otaheeté apple.					30	32	34½	38	41	45																	
——— mangifera.	S. Amarataca.—H. and B. Amra.																	50	52½	55	57							
Sterculia alata. R.	B. Toolah.						21	24½	27¼	31																		
——— guttata. R.	See Hortus malabaricus, 4 × 61.																											
——— villosa. R.								25	27½	—	—	32	34¼	37½	39	41												
——— colorata. R.	T. Karaka.									30½	33½	37	40															
——— fetida.										23¾																		
Strychnos Nuxvomica.	S. Culaca.—H. Cuchila.							20	22	24½	26	27½	30															
13. Swietenia Mahogoni.	Mahogany from the West Indies						25½	30¼	—	—	41	44	47	50	54													
——— Chickrassa. R.	H. and B. Chickrassy.								25	28	—	—	37½	39½	41½	—	44	46½										
——— febrifuga. R.	T. Soymida.—H. Rohina.—Tam Woonæ-marum.								21½	24½	—	—	—	37¼	40⅓	43	45½	47	49									
——— chloroxylon. R.	T. Billoo.—E. Satin-wood.								23¼	24½	26½																	
Tamarindus indica.	S. Amlica.—H. and B. Amli.						18¼	21½											46½	49½	52	54	56					
Tamarix indica.	S. Ihaveeka.—H. and B. Ihau.													48	50	52	53	—	60									
Tectona grandis.	H. and B. Shegun.—T. Teek.—Can. Iaaddy.—Mn. Iatus.	7	10½						18¼	21½						42½	44¼	—	—	50	52	54	55½	57½				
The same in a more favorable soil										42					54½	58¼												
Terminalia procera. R.	From the Andaman Islands.					25½			23	25	—	—	32	34	36	37½	39	40										
——— Catappa.	H. Badam.				15½					30	32½	—	—	40	43	46	48½	50	51½									
14. ——— Chebula.	S. and B. Hari-taka.—H. Har.—A. Athlilej.			21	25	29	32																					
15. ——— Bellerica.	H. and B. Bohera.—P. Beleleh.									20	23¼	—	—	31½	34	36	38½	40¼										
Ulmus integrifolia. R.										34																		
Uvaria odorata.	Mn. Cananga.			14	19	—	—	29	31½	34	36	37½	39½															
—— longifolia.	S. Deva-daree.—H. Debdaru.			8½	10¼	13	15	16½	18½																			
Vitex leucoxylon.												29½	31	33														
—— alata. R.	H. Asula.											30	31	32														
Xanthochymus pictorius. R.	B. Denphol.													8½												26		
——— dulcis. R.																												

Note 1. When one or more columns intervene in the same line, without being joined by a line of ink, the measurements to the right and left of the vacancy were not taken from the same trees; but when joined, they are the same, and bear a reference to each other, as well as when no vacant column comes between.

Note 2. In the column of Synonyms S. means Sanscrit.—H. Hindustanee.—B. Bengalee.—T. Telinga.—Tam. Tamul.—C. Cingalese.—Can. Canara.—Mn. Malayan.—A. Arabic.—P. Persian.—E. English.—Burm. the Burma Language, and R. after the Trivial (or Specific) name implies all such as appear new to Dr. R., and that such Trivial names have been given by him.

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INDEX.

A

Pag

ACID SULPHURIC, FROM SULPHUR, WITHOUT THE USE OF ANY NITRIC SALT, premium offered to the person who shall prepare the largest quantity of 11

ACORNS, premiums offered for planting 4

ADVERTISEMENT, general

on Analytical Index of the first twenty-five volumes of the Transactions of the Society 24

on catalogue of books 24

on the thirty-first volume of ditto 24

on persons advertising under the Society's sanction, who have not obtained the same 24

AGRICULTURE, notice to candidates in the class of 4

premiums offered in 4 to 9

bestowed in 22

papers in 25

ALLEN, Miss Mary, the Silver Isis Medal to, for an original miniature 22

ANNATTO, premium offered for the importation of 20

ARCHITECTURAL DESIGNS, premiums offered for the design of a national mausoleum 13

ASH, premiums offered for having sown or set the greatest quantity of 4, 5

B

Page

Backhouse, Mr. Edward, the Gold Medal to, for his plantation 22
his communications on the subject 32, 33
Beans, premium offered for cultivating 5
and Wheat, premium offered for dibbling and drilling 5
Bees-Wax and Honey, premiums offered for 6
Behnes, Mr. William, the Silver Isis Medal to, for an outline of the Gladiator Repellens 22
Bhaugulpore Cotton, premium offered for the importation of the greatest quantity of 20
Black Lead Pencils, premium offered for freeing from impurity 14
Blue Pigment from Iron, premium offered to the person who shall discover the best 11
Bocquet, Mr. E. the silver Isis medal to, for an engraving of a portrait 23
Boring and Blasting Rocks, premium offered to the person who shall discover a simple, safe, and cheap method of 17
Boyce, Mr. Thomas, the silver medal and ten guineas to 23
his communications on the subject 177 to 181
Braby, Mr. James, five guineas to, for his improved cart and drag 22
his communications on the subject 45 to 47
Bronzes, premium offered for the best drapery figure or group cast in bronze 13
Buck Wheat, premiums offered for cultivating the greatest quantity of land with 6
Byron, Mr. L. the silver Isis medal to, for a Sinical Octant 23
his communications on the subject 117 to 181
Burdett, Miss Maria, the silver Isis medal to, for a drawing 23

C

Page

CAFE, Mr. Thomas Smith, the silver medal to, for an outline of the Gladiator Repellens 22

CAT-GUT EQUAL TO THE ROMAN OR ITALIAN, premiums offered for the best method of manufacturing 16

CATTLE, premium offered for the best experiments on stall-feeding 9

CHEESMAN, Mr. Thomas, the gold Isis medal to, for an engraving of the Plague Stayed 23

CHEMISTRY, premiums offered in 9, 10, 11, 12

CHESNUTS, premiums offered for having sown or set the greatest quantity of 4

CHINTZ PATTERNS FOR CALICO PRINTERS, premium offered for the best 15

CLAGUE, Miss Ann, the silver Ceres medal to, for a method of obtaining an early growth of potatoes 22

her communications on the subject 62 to 66

CLEGHORN, Mr. T. the silver medal to, for a buoyant line 23

his communications on the subject 181 to 201

CLOTH FROM HOP STALKS, NETTLES, &c. premium offered for the productions of 14

COBALT, ZAFFRE AND SMALT, premium offered for the discovery of a mine in Great Britain of 12

COCHINEAL, premium offered for the importation of the greatest quantity of true 20

COLONIES AND TRADE, premiums offered in 18 to 20

papers in 196 to 210

COMPARATIVE CULTURE OF WHEAT, BROADCAST, DRILLED, AND DIBBLED, premium offered for 5

CONDITIONS, general 20 to 21

in polite arts 14

Page

Copper Plate Patterns for Calico Printers, premium offered for the best 15

Cousins, Samuel, the silver medal to, for a drawing 23

Culture of Hemp, premiums offered for the 9

Cure of the Rot in Sheep 8

Foot Rot in Sheep 8

Curwen, J. C. Esq. the Thanks of the Society to, for additional information on soiling, or feeding of cattle in the house, and other improvements connected with agriculture 56 to 61

D

Destroying the Insect commonly called the Borer, premium for discovering the most effectual method of 19

the fly on hops, premium offered for ascertaining the most easy and efficacious method of 8

the Grub of the Cockchaffer, premium offered for 8

Worms, premium offered for an effectual method of 8

Destructive Effects from Moths, premium offered for discovering an effectual method of preventing the 11

Drawings by Engravers' Pupils, premium offered for the best finished 13

by Gentlemen, honorary premiums for 13

Historical, premiums offered for the best 13

by Nobility, honorary premiums offered 13

in General, premiums offered for 13

of Landscapes, premiums offered for the best 13

of the Hand and Foot, premium offered for 13

of Outlines 13

Pen, of a Head, premium offered for 13

Perspective

Page

DRAWINGS, &c. &c. &c.
Perspective of Machines, premium offered for the best 13
DRURY, Mr. Charles, the silver Isis medal to, for his horse-feeder 23
his communications on the subject 158 to 162

E

ELMS, premiums offered for having planted the greatest quantity of English 4
premium offered for a substitute for water pipes 17
ENGRAVING, HISTORICAL, premiums offered for the best 13
Landscape, premiums offered for 13
Medal Die, premiums offered for 14
of a Portrait 14
on Wood Blocks, premium offered for 14
ENSOR, Miss E. A. the silver pallet to, for a drawing 23
ETCHING OF LANDSCAPES, premiums offered for the best 13
An Historical Subject 13
A Portrait 14
EXPERIMENTS TO ASCERTAIN THE PROPER THICKNESS OF WICKS FOR CANDLES 15
EXTINGUISHING FIRES, premium offered for the most effectual method of 17

F

FAMILY MILL, premium offered to the person who shall invent an easy and expeditious working 16
FAREY, Mr. J. jun. the silver medal to, for an instrument useful in perspective drawings 23
his communications on the subject 71 to 76
FEMALES, premiums offered for the employment of 14
FOLSCH, Mr. the gold Isis medal to, for his method of facilitating reading and writing 23
his communications on the subject 162 to 166

Page

FOREST TREES, premiums offered for planting 5

G

GAINING LAND FROM THE SEA, premium offered for 7
GEDDES, Miss Margaret, the gold medal to, for an original oil painting 22
GLAZING EARTHEN WARE WITHOUT LEAD, premium offered to the person who shall discover the cheapest method of 12
GLOVES EQUAL TO FRENCH KID, premium offered for making 16
GUNPOWDER MILLS, premium offered for an effectual method to prevent explosion in 16

H

HALSTEAD, Miss Elizabeth, the silver medal to, for an oil painting 22
HARDING, Mr. Frederick, the silver Isis medal to, for a drawing 22
HARRIOTT, W. H. Esq. the gold Isis medal to, for an original landscape 22
HARVESTING CORN IN WET WEATHER, premium offered for the cheapest method of 7
HAY MEADOW, premium offered for making in wet weather 7
HAYTER, Master John, the silver pallet to, for a pencil outline 2
HEATING ROOMS FOR THE PURPOSE OF MANUFACTURES, premium offered for the discovery of a superior method to any hitherto known of 17
HEDDERWICK, Mr. Peter, the silver medal and twenty guineas to, for a double piston pump 23
his communications on the subject 98 to 101
HEGDELAND, Mr. Caleb, the silver Isis medal to, for a model of Exeter Cathedral 23

Page

Hemp, premium offered for the culture of, in the united empire 9
Cultivation of, in Upper or Lower Canada, premium offered for 19
in Lower Canada, premium offered for 19
in Nova Scotia and New Brunswick 19
Importation of, from Canada, Nova Scotia, and New Brunswick, premium offered to the master of that vessel who shall bring to this country the greatest quantity of 19
Substitute for, premium offered for a 19
Herrings, premiums offered for curing, equal to the Dutch 18
Higgins, Godfrey, Esq. the gold medal to, for improving waste land 22
his communications on the subject 27 to 31
Hogs' Bristles, premium offered for the greatest quantity of, equal to those imported from Russia or Prussia 15
Hookey, Mr. William, the gold medal to, for his method of bending straight timber 23
his communications on the subject 91 to 97
Horn, Mr. William, the silver medal to, for his machine for cutting canvas 23
his communications on the subject. 152 to 156
Hurlstone, Master F. Y. the silver Isis medal to, for a drawing 23

I

Improving Land Lying Waste, premiums offered for 7
Indelible Ink, premium offered for 10
Iron, premium offered for preserving from rust 12
premium for fine bar 12

K

Kali for Barilla, premiums offered to the persons who shall have cultivated the greatest quantity of land for 18, 19
Kendrick,

Page

KENDRICK, Miss Emma, the gold Isis medal to, for an orinal miniature of religion 22

KEW, Henry, Esq. the silver medal set in gold to, for a camel's hair pencil drawing 22

KEYWORTH, Mr. Thomas, five guineas to, for instructing poor children to write in a cheap and easy manner 23
his communications on the subject. 167 to 173

L

LANDSCAPE ENGRAVING, premium offered for the best finished 13

LANDSEER, Master Edward, the silver Isis medal to, for a drawing 23
Master T. the silver Isis medal to, for an oil painting 2

LARCH, premiums offered for having planted the greatest number of larch trees 4

LAURENCE, John, Esq. the thanks of the Society to, for an improved pair of crutches 10
his communications on the subject 109, 110

LEVIEN, Mr. M. ten guineas to, for his harp guitar 23
his communications on the subject 117 to 121

LIDDELL, Wm. Esq. the gold medal to, for planting oaks 22
his communications on the subject 25 to 27

LONDON, Mr. Phillips, the thanks of the Society to, for his further communications on pickling mackarel 202 to 206

M

MACHINE FOR DIBBLING WHEAT, premium offered for 8
for raising Coals, Ore, &c. premium offered for 16
for raising Water, premium offered for 17
for reaping and mowing Corn, premium offered for 8
catalogue of 215 217
for threshing, premium offered for 8

Page

MACKAREL, premiums offered for curing 18
MAKING MEADOW HAY IN WET WEATHER, premium offered for ascertaining the best mode of 7
MANUFACTURES, premium offered in 14, 15, 16.
bestowed in 23
papers in 85
MANUFACTURING TALLOW CANDLES, WITH PROPERTIES RESEMBLING WAX, premium offered for 10
Candles from Resin or other substances 10
MANURES 7
MAP OF ENGLAND AND WALES, premium offered to the person who shall publish a mineralogical 12
of Ireland 12
of Scotland 12
MARBLES, premium offered to the person who shall discover, within Great Britain, a quarry of white statuary 11
MARINE PAINTING, premiums offered for the best performances of 13
MARSHALL, Mr. S. the silver Isis medal and ten guineas to, for a calico-printer's block 23
his communications on the subject 85 to 90
MARTIN, Mr. William, the silver Isis medal and ten guineas to, for a weighing machine 23
his communications on the subject 157 to 158
MECHANICS, premiums offered in 16 to 18
bestowed in 23, 24
papers in 91 to 196
MILLER, John, Esq. the thanks of the Society to, for his method of preserving persons from drowning when the ice breaks under him; and his communications 194 to 195

Page

Members, elected since the last distribution 24
list of contributing 307
corresponding 356
to correct their address when erroneous 24 and 255
Models and Machines, a list of those rewarded during the session. 215
Moore, Miss Mary Ann, the silver palette to, for a drawing 23
Moths, premium offered for discovering an effectual method of preventing the destructive effects from 11
Muslin, premium offered for rendering it less combustible 11

N

Natural History, premium offered to the person who shall publish the, of any county in the united kingdom 12
Nicholson, Mr. Peter, the gold Isis medal to for preparing and squaring wreathed hand-rails 23
his communications on the subject 121 to 144
twenty guineas to for his centro-linead, 23
his communications on the subject 67 to 70
Norway Fir Seedlings, preminm offered for planting 5
Nutmegs, premium offered for the greatest quantity of merchantable 18

O

Oaks, premium offered for ascertaining the best method of raising 4
Officers of the Society, list of 3
Oil, premium offered for paintings in 13
offered for, from porpoises 18

Page

P

PAGE, Miss Harriet, the silver palette to, for a drawing of flowers 22
Miss Sophia, the silver palette to, for ditto 22
PAINT, premium offered for a white substance for the basis of 11
PAPER FROM RAW VEGETABLE SUBSTANCES, premium offered for the manufacture of 15
transparent, premium offered for the best method of making 15
PARKE, Henry, Esq. the gold Isis medal to, for an original marine painting 22
PARSNIPS for Cattle or Sheep, premium offered for the cultivation of land for growing 6
PEART, William, Esq. the gold medal to, for a drawing of fruit, &c. 22
PHILLIPS, Miss Eliza, the silver medal to for an original landscape 22
Mr. George, the gold medal to, for his design of a gothic mausoleum 22
PHILLIPS, Mr. Leonard, Jun. the gold Ceres medal to, for the culture and application of the mangel wurzel 22
his communications on the subject 48 to 55
PLASTER CAST, premium offered for the best 13
PLOUGH, premium offered for a paring 8
POLITE ARTS, conditions for 14
premiums offered in 13, 14
bestowed in 22, 23
papers in 67
PORPOISES, premium offered for taking 18
POTATOES, premiums for cultivating the greatest quantity of 7
premiums for preserving 7

Page

PREFACE iii to xvi

PREMIUMS AND REWARDS BESTOWED 22, 23, 24

Offered for the advantage of the British Colonies 18, 19, 20

Offered for the advantage of the British Settlements in the East Indies 20

Offered for the advantage of the Commerce of the United Empire 18

in Agriculture 4 to 9

in Chemistry, Dyeing, and Mineralogy 9 to 12

in Colonies and Trade 18 to 20

in Manufactures 14 to 16

in Mechanics 16 to 18

in Polite Arts 13, 14

for Drawings in General 13

for the best Copy 13

To obtain a List of 24

PREPARATION OF ANY ALKALINE OR EARTHEN NITRATE, premium offered to the person who shall discover a 12

of a Green Colour for Printing Cotton Cloth, premium offered for 11

of a Red Stain for Cotton Cloth, premium offered for the best 10

PRESERVING IRON FROM RUST, premium offered to the person who shall discover the means of 12

Cabbages, premiums offered for 6

Carrots, Parsnips, or Beets, premiums offered for 6

Salted Provisions from becoming Rancid or Rusty, premiums offered for the best and most efficacious method of 9

PRESERVING SEEDS OF VEGETABLES, premium offered for the best method of 9

Turnips, premium offered for 6

PRE-

Page

PRESENTS RECEIVED BY THE SOCIETY 211 to 213
PREVENTING ACCIDENTS FROM HORSES FALLING WITH TWO-WHEELED CARRIAGES, premium offered for the best method of 17
the Blight, or Ravages of Insects on Fruit Trees and Culinary Plants, premium offered for the most effectual method of 18
the Dry Rot in Timber, premium offered for the most effectual method of 9
the ill effects of Flies on Sheep, premium offered for the best method of 9
the prejudicial effects to the Persons employed in Pointing Needles 18
PROTECTING SHEEP, premium offered for the best method of 9

R.

RAISING GRASS SEEDS, premium offered for 6
the Bodies of Persons who have sunk under Water, premium offered for the best portable Drag for 17
Water for the Irrigation of Land, premium offered for 8
RANSON, Mr. the Silver Medal to, for an Engraving 23
RED PIGMENT, premium offered for discovering 11
REFINING BLOCK TIN, premium offered to the person who shall discover the best means of 12
Copper from the Ore, premium offered to the person who shall discover the best means of 12
Whale or Seal Oil, premium offered for an effectual method of 9

Page

ROADS, premium offered for discovering the most effectual and cheapest method of improving Turnpike and other 17

ROBERTSON, Mr. James, the silver Palette to, for a landscape 22

ROFFÉ, Master A. T., the silver Isis medal to, for an academical drawing 23

ROXBURGH, Dr. William, the gold Ceres medal to, for important communications on the products of the East Indies 24

his communications 207 to 210

RUSSETT, Mr. Charles, the silver palette to, for a drawing 22

S.

SAY, Miss Mary Ann, the silver medal to, for a drawing of the three Marys 22

SCOTT, T. H., the gold ceres medal to, for his plantations and improvement of land 22

his communications on the subject 34 to 38

SCOTT, Mr. George, the gold Isis medal to, for uniting the standing rigging of ships broken in action 23

his communication on the subject 192 to 194

SECURING PLANTATIONS OF TIMBER-TREES AND HEDGE-ROWS 5

SHEEP, premiums offered for the best and most effectual method of curing the rot in 8

premium offered for the cure of the foot-rot in 8

premium offered for discovering a method of preventing the ill effects of flies on 9

premiums offered to the person who shall have sold the largest quantity of Merino wool 15

SHEPPARD, Miss M., the silver medal to, for a drawing of Silence 22

Page

EVERS, Mr. H. E., the gold Isis medal to, for his method of curing herrings after the Dutch manner 24
his communications on the subject 197 to 201

SIEVER, Miss Frances, the silver palette to, for a head of King Richard 23

SILK, premiums offered to those who shall grow the greatest quantity of, in Malta - 19

STATUARY MARBLE, premium offered for the discovery of a quarry within Great Britain, of white 11

STARCH, premium offered for the best method of increasing the force of 10

STONE, Mr. James, the silver medal and five guineas to, for a door-spring 24
his communications on the subject 173 to 175

SUBSTITUTE FOR TAR, premium offered for the best 10

SUGAR IN A SOLID FORM FROM TREACLE, premium offered for the best method of separating 10

SUTHERLAND, Miss Henrietta, the silver Palette to, for a drawing 22

T.

TAKING PORPOISES, premium offered for 18

WHALES BY THE GUN-HARPOON, premium offered for 16

TAN, premium offered for a preparation of 10

TAR, premium offered for the best substitute for 10

THEOBALD, Mr. William, the silver palette to, for an oil painting 22

TOMKINS, Miss M. E., the silver Isis medal to, for a drawing 23

Miss S. M., the silver palette, for a drawing 23

TURPENTINE FROM THE SCOTCH FIR, OR PINUS SYLVESTRIS, premiums offered for the greatest quantity of 10

Page

Turrell, Mr. Edmund, the silver Medal to, for a perspectograph 23
his communications on the subject 76 to 83
Transit Instrument, premium offered for a portable 16
Turner, Mr. John, the silver medallion to, for an original design of a church 23

U.

Ultramarine, premium offered for preparing an artificial 11

V.

Ventilation, premium offered for improved

W.

Walking Wheel, premium offered to the person who shall invent an improved 16
Walnut Trees, premiums offered for planting 5
Ward, Mr. W. James, the Silver Isis Medal to, for a Pen and Ink Drawing 23
Ward, Mr H. the Silver Medal and Five Guineas to, for an Equation Work for a Clock 23
his communications on the subject 144 to 151
Whissen, Miss, the Silver Medal to, for an original Drawing 22
Whitehead, Mr. John, the Silver Palette to, for a Plaster Cast 23
Wicks for Candles or Lamps, premiums offered for the manufacturing from hop-stalks or vines 15

Page

WILKINSON, Mr. James, the Silver Medal and Ten Guineas to, for a Turn-rise Plough 22
his communications on the subject 38 to 45
WILLIAMS, Mr. Charles, the Silver Medal and Twenty Guineas to, for a Portable Corn-Mill 23
his communications on the subject 102 to 105
WILSON, Mr. Charles, Five Guineas to, for a Sash-Window to be cleaned without danger 24
his communications on the subject 176, 177
WOODALL, Mr. John, the Silver Medal to, for a Wind-up Bedstead for the Sick 24
his communications on the subject 105 to 108
WOODEN PIPES FOR WATER, premium offered to the person who shall discover a superior method for laying 17
WYAN, Mr. William, the Gold Medal to, for a Medal Die 23

Z.

ZIEGLER, Mr. Henry, the Silver Isis Medal to, for an Oil Painting 23

Reference to the ENGRAVINGS, *and Directions to the* BOOKBINDER.

Place the Portrait of the late Sir William Dolben, Bart. to face the Title page.

The Plate, No. 1, of Mr. Wilkinson's Turn-wrest Plough, and Mr. Braby's Cart and Drag, to face page 38.

The Plate, No. 2, of Mr. P. Nicholson's Centro-linead, Mr. Farey's Instrument for drawing Lines to an inaccessible centre, and Mr. Edmund Turrell's Perspectograph, to face page 70.

The Plate, No. 3, of Mr. S. Marshall's Calico-printing Block, to face page 86.

The Plate, No. 4, of Mr. Wm. Hookey's Machine for bending large Ships' Timbers, to face page 92.

The Plate, No. 5, being a continuance of the same subject, to face page 94.

The Plate, No. 6, of Mr. Hedderwick's double Piston Pump, to face page 100.

The Plate, No. 7, of Mr. C. Williams's Family Mill for grinding corn, to face page 104.

The Plate, No 8, of Mr. Woodall's Wind-up Bedstead for the sick and lame; and Mr. Laurence's improved Crutches, to face page 108.

The Plate, No. 9, of Mr. L. Byron's sinical Octant; and Mr. Levien's Harp-Guitar, to face page 116.

The Plate, No. 10, of Mr. P. Nicholson's method of squaring a Hand-rail round the Winders of a Staircaise, to face page 130.

The Plate No. 11, being a continuance of the same subject, to face page 136.

The Plate, No. 12, being a further elucidation of the same subject, to face page 142.

The Plate, No. 13, of Mr. H. Ward's Equation Work for a Clock, to face page 148.

The Plate, No. 14, of Mr. W. Horn's Machine for cutting Canvas, of Mr. W. Martin's Index Weighing Machine, and of Mr. C. Drury's Horse-feeder, to face page 156.

The Plate, No 15, of Mr. F. Folsch's Substitute for a Slate, and Mr. T. Keyworth's Horn Tablet, to face page 164.

The Plate, No. 16, of Mr. J. Stone's Double Door Spring, and Mr. C. Wilson's mode of hanging Sash-Windows, to face page 174.

The Plate, No. 17, of Mr. T. Boyce's Life Buoy, Mr. Cleghorn's Buoyant Line, Mr. Scott's method of uniting Ship's Rigging, and Mr. Miller's Safety Poles, to face page 188.

The Plate, No. 18, showing the action of Mr. Clegg's Buoyant Line, and Mr. Boyce's Life Buoy, to face page 196.

Dr. Roxburgh's large Table, containing the names and growth of Trees in the East Indies, to face page 210.

*** By an alteration in the Rules and Orders of the Society, entered December 14th, 1814, the future meetings of the Society will close on the second Wednesday in June, and the Session commence on the first Wednesday in November following.

END OF VOL. XXXII.

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